Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Implementation of Section 224 of the Act; Amendment of the Commission's Rules and Policies Governing Pole Attachments	WC Docket No. 07-245 RM-11293 RM-11303

To: The Commission

INITIAL COMMENTS OF NEXTG NETWORKS, INC.

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Summary

In 1998, the Commission ruled that wireless devices qualify as "attachments" under Section 224, and thus, wireless telecommunications carriers are entitled to attach such devices on utility poles at regulated rates, terms and conditions. In the ten years that have passed, some progress has been made, however, a significant number of pole owners, particularly electric utilities, have ignored the Commission's orders and run roughshod over the attachment rights granted by Congress to NextG and other telecommunications providers that include wireless facilities in their networks. On a regular basis, NextG encounters lengthy delays, demands for exorbitant, "market" pole rental fees, categorical denials of access to pole tops ostensibly on the basis of unfounded safety concerns, and a host of egregious terms and conditions of attachment. NextG believes that this problem stems in large part from the fact that the Commission has not adopted wireless-specific pole attachment regulations.

The Commission should adopt specific rules reiterating its prior holdings that pole attachment rates for wireless devices are *regulated*, and not based on a "market" for poles that does not exist. Moreover, the Commission should eliminate any ambiguity about the rate formula that applies for wireless attachments and should expressly order a straight-forward application of the existing rate formula to wireless attachments: the utility's telecommunications pole attachment rate multiplied by the number of feet of useable space actually occupied by the wireless attachment. Further, the Commission should not permit utilities to charge higher rents for pole top attachments because (1) such action is not authorized under Section 224; (2) pole tops are no more unique than any other portion of a utility pole; and (3) such an approach would be an open invitation for abusive rates that would effectively deny NextG access to pole tops.

In addition, a set of specific attachment rules are needed in order to eliminate ambiguity and to clearly identify the rights of attachers using wireless facilities and the obligations of utility pole owners with respect to wireless attachments. NextG submits that the Commission should adopt rules that explicitly recognize and protect wireless attachments, including the following:

- a rule that pole top attachments must be allowed;
- a rule prohibiting allowing all-dielectric self supporting ("ADSS") fiber installation in the "power space" on poles and prohibiting pole owners from categorically prohibiting attachments to any part of the pole where the attachments would comply with the NESC;
- a rule permitting the installation of equipment boxes in unusable space;
- a rule permitting attaching parties to use any qualified electrical workers to perform make-ready work and to install and maintain wireless attachments;
- a rule prohibiting utilities from declaring street light poles and poles with attachments above a certain voltage "off limits" to wireless attachments;
- rules mandating performance of preconstruction surveys and completion of make-ready work within the specific timeframes set forth above; and
- a rule establishing a presumption that wireless attachments that comport with the NESC and FCC and OSHA regulations may not be denied on the basis of safety or reliability.

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NextG Networks, Inc., on behalf of its operating subsidiaries NextG Networks of NY, Inc., NextG Networks of California, Inc., NextG Networks Atlantic, Inc., and NextG Networks of Illinois, Inc. ("NextG"), respectfully submits these Comments pursuant to the Notice of Proposed Rulemaking ("NPRM") released by the Federal Communications Commission (hereinafter, the "Commission") on November 20, 2007 in the captioned proceeding. NextG's Comments primarily will address the issues pertaining to the attachment of wireless devices to utility poles that are set forth in paragraph 34 of the NPRM as well as issues pertaining to terms and conditions of access set forth in Section IV of the NPRM.

I. INTRODUCTION

NextG appreciates the opportunity to relate its experiences attaching (or attempting to attach) its telecommunications facilities, which include wireless devices, to distribution poles around the nation. The Commission first declared that wireless devices qualify as attachments in 1998, and some progress has been made since that time. Indeed, NextG has found some pole owners to be cooperative and reasonable in responding to requests for attachments. Many more utilities, however, initially have responded by saying that they have no internal standards or

guidance that would allow them to enter into such agreements and that such standards and agreements would need to be developed -- through a long process. Because the Commission has never promulgated a set of wireless-specific pole attachment rules, the lack of such rules and clear guidance has created ambiguities and differing interpretations by utilities that, intentional or not, have acted to impede, restrict or outright deny NextG access to utility poles. Accordingly, the *status quo* is not working in all cases, and the result is a deterrent to the prompt and timely deployment of broadband and competitive telecommunications services. NextG respectfully submits that the Commission should use this opportunity to promote the deployment of competitive networks, and particularly broadband and next generation wireless networks, by adopting rules explicitly recognizing and protecting attachments of wireless facilities, as set forth below.

II. BACKGROUND REGARDING NEXTG

A. NextG's Telecommunications Service And DAS Networks

NextG provides telecommunications service via Distributed Antenna Systems ("DAS"). As a result, it is at the cutting-edge of the provision of telecommunications services using advanced technologies and capabilities – both wireless and wireline. At its most basic level, NextG provides telecommunications services to wireless providers that enable those entities to provide next-generation broadband and telecommunications wireless services and achieve greater coverage and capacity for their wireless services. NextG's telecommunications service and network are currently utilized primarily by Commercial Mobile Radio Service ("CMRS") providers, however, its networks and services are not limited to CMRS providers. While frequently focused initially on a specific customer's needs, NextG can host multiple carriers and is therefore an efficient, cost-effective alternative for the deployment of multiple wireless telecommunications facilities. In other words, NextG enhances the performance of existing

mobile wireless infrastructure with minimally intrusive installations using, to the extent possible, existing infrastructure.

As wireless providers seek to deploy the next generation of wireless services and meet the demands for improved capacity and coverage for existing services, one of the key obstacles they face is the technical limitations of traditional "high site" antenna towers and local management of their placement. Traditional towers and rooftops may be reasonable solutions for providing low capacity, wide-area coverage (assuming the sites can be built or acquired where they are needed, which often is a problem). As demand for capacity on wireless networks grow, however, more and more sites must be added to networks so that the frequency spectrum that a particular operator owns can be reused more often.[1]

NextG believes that one of the most effective ways to add sites is through the use of "low" site antennas. These types of antenna sites facilitate a greater reuse of the wireless spectrum because relatively low-height antennas can be more easily isolated from each other, thus resulting in a much higher capacity and quality network that is not possible with a network consisting entirely of high-site antennas. In addition to capacity benefits, a network of "low" sites in an urban area can provide coverage in many "dead-spots" that would be "shadowed" under the traditional antenna locations or where zoning laws simply prohibit the installation of high-site facilities. Higher capacity and greater coverage, in turn, are the necessary building blocks for broadband wireless services.

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[1] Capacity in a cellular network comes, in general, from reusing spectrum. The greater the number of radiating elements, the more often spectrum can be reused and the more capacity the network will have. Of course, this general statement varies somewhat depending on the type of technology used, *i.e.*, variants of TDMA or CDMA gain capacity and system performance in different ways. NextG's wireless solution is "protocol agnostic" and can accommodate all forms of wireless technologies.

The architecture of NextG's DAS facilities consists of fiber-optic lines leading to and connecting various equipment and antennas at remote locations called "Nodes" with a central "hub," which typically is located in a building on private property. While NextG installs its fiber-optic lines either underground, in conduits, or aerially on poles, it must install its Node equipment (antennas and related equipment boxes) on poles. NextG's service requires a contiguous grid of relatively closely spaced "low site" antennas. For these reasons, access to poles in the public rights-of-way and utility easements (*e.g.*, utility poles, street light poles or traffic signal poles) is critical (from both a technical and economic perspective) for the deployment and operation of NextG's networks. NextG uses either poles owned by the local utility company or poles owned by the municipality, or a combination of both.

The DAS networks that NextG seeks to install on distribution poles typically are comprised of: (1) fiber-optic cable, which is attached horizontally to utility poles in the traditional manner; (2) small pole-mounted antennas; and (3) small pole-mounted equipment, containing transmission electronics for the system that is connected to the fiber-optic cable and antennas. While NextG serves wireless providers and incorporates antennas into its network, its system consists primarily of wireline (fiber-optic cable) attachments to existing poles. The antennas and cabinets (*i.e.*, nodes) typically are attached on 7 percent or less of the total poles utilized in the DAS network.

The equipment NextG is deploying for its current DAS networks typically includes either an omnidirectional antenna or a directional panel antenna, as well as an equipment box located on the pole's unusable space that is of differing size depending on the particular deployment. Pictures of typical installations of NextG's equipment on utility poles are provided in Attachment 1. NextG's antennas will be installed in some cases in the "communications space"

on the pole (*i.e.*, mid-pole), but in most cases on the pole top. Indeed, pole top attachment is the only feasible location in some locations or markets.[2] In cases where necessary to maintain proper space clearances, NextG will install pole top extensions that are 4 to 6 feet in length.

B. NextG's Experience With Pole Owners

Even though NextG's DAS networks are chiefly wireline, NextG nevertheless has encountered obstacles to the placement of its facilities on utility poles throughout the country. In particular, NextG is concerned with timely performance of pre-construction surveys and make-ready and the interpretation of what should be generally applicable construction standards in ways that unreasonably preclude the use of certain poles or force NextG to install its plant beyond what the applicable standards actually require.[3] In this way, NextG has been subject to unreasonable access denials and excessive, but unnecessary, make-ready delays and costs.[4]

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[2] *See NextG Networks of NY, Inc. v. Public Service Electric & Gas*, EB-07-MD-004, Reply Declaration of Norine Luker at ¶¶ 9-11 (filed Feb. 11, 2008).

[3] Despite the fact that the NESC addressed clearance and other issues, pole owners sometimes impose construction standards and limits that exceed the NESC. There is no basis for such excessive demands. Moreover, the variation among pole owners' "standards" creates uncertainty and makes it difficult for attaching parties to plan their deployments and estimate costs. This is particularly the case where the utility responds to a request to attach by asserting that it must first develop construction standards specifically for wireless attachments – a process that then takes many months if not years. The Commission should clarify that the NESC governs all attachments and that individual pole owners cannot impose more strenuous standards, particularly on fundamental issues addressed by the NESC, such as clearances or delay attachment in order to develop entirely new construction standards.

[4] Indeed, in December 2007, NextG had to file a complaint with the Commission against PSE&G for denial of access. Seven months after NextG applied, PSE&G, without explanation or support, categorically denied NextG attachment to the tops of PSE&G's poles, as NextG had requested. *NextG Networks of NY, Inc. v. Public Service Electric & Gas*, File No. EB-07-MD-004, Complaint at ¶¶ 8-27 (filed Dec. 21, 2007).

In NextG's experience, some pole owners make unsupported claims that certain wireless structures on distribution poles are unsafe. As discussed below, these claims are untrue.[5] Wireless devices can be, and have been, safely installed on utility poles, including at the top, without adversely affecting safety or reliability. Indeed, the National Electrical Safety Code ("NESC") already contains rules governing such attachments. The fact remains that distribution poles are essential, bottleneck facilities in the possession of monopolies, some of which compete directly with certain wireless attachers. The Commission should take this opportunity to adopt rules to ensure that pole owners are not using their unique position to thwart deployment of competitive networks or to leverage an unlawful windfall profit.

Delays in obtaining attachment rights are significant problem facing NextG. When NextG initially approaches a utility to request attachment, the response commonly is "no, wireless attachments are not permitted because of company policy" or "no, because wireless attachments are not safe." Often, NextG is directed to discuss attachment with the utility's "business development" group, which is tasked with treating pole attachments not as a regulated obligation of the utility, but as a profit center. (Ironically, these "business development" groups have developed "safe" methods for attachment of antennas to transmission infrastructure that carries much higher voltages and therefore pose much more serious safety and reliability issues than distribution infrastructure that allegedly raises insurmountable safety concerns.) However, once the pole owner has been convinced through strenuous effort – and time – that the joint use department of the utility is a more appropriate group to handle NextG's agreement, in almost all

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[5] As NextG's detailed submissions in its case against PSE&G demonstrate, PSE&G's "safety" concerns were meritless. *NextG Networks of NY, Inc. v. Public Service Electric & Gas*, File No. EB-07-MD-004, Reply at 10-20; Reply at Exh. 5 (Declaration of David Marne) (filed Feb. 11, 2008). Due to the volume of evidence submitted by NextG in support of the safety of its attachments in the case, NextG will not re-attach the materials as exhibits hereto.

cases, pole owners have claimed that they do not have a "wireless" attachment agreement or construction standard for distribution poles, and so they cannot respond to NextG's request for access until the utility develops one. This usually takes several months or even years, and in more than one situation, the utility has still not provided the wireless-specific exhibits to its form agreement more than *two years* after NextG initially contacted the utility. After months -- and often *years* -- of discussions and negotiation, many (but by no means all) utilities have moved beyond their initial objections and negotiated mutually acceptable methods of attachment. However, the inability to design DAS networks in the interim due to the uncertainties regardomg what NextG can attach and where it can attach has caused significant problems for NextG and severely impeded its ability to serve its customers and the public.

Another flavor of this sort of utility response is exemplified by one large power utility that covers large portions of the southern United States. This particular electric utility refused to enter into an attachment agreement or discuss rates, terms and conditions or where NextG could attach antennas on the pole until NextG identified the specific pole(s) intended for use. This precondition of negotiations made it impossible to design and market a DAS network in those areas.

The Commission should make clear that the attachment of an antenna is not the opportunity for a pole owner to invent a whole new attachment regime. Delays like those encountered by NextG and others are delaying the deployment of competitive networks and services. Indeed, the Commission has recognized the public policy benefits of affording wireless carriers with access to utility poles as it "facilitates the deployment of cell sites to improve the coverage and reliability of their wireless networks in a cost-efficient and environmentally friendly manner. Such deployment will promote public safety, enable wireless carriers to better

provide telecommunications and broadband services and increase competition and consumer welfare in these markets."[6]

As another real-world example of the onerous, and patently unlawful, restrictions that some utilities attempt to impose on wireless attachments, the following summarizes some of the more egregious provisions of the standard (*i.e.*, non-negotiable) wireless attachment agreement of another major electric utility located in the southeastern United States:

- The utility "reserves the top eleven (11) feet of the Distribution Pole for its Facilities" and thereby categorically denies NextG pole top access to its utility poles;
- The utility categorically denies access to all poles with facilities carrying more than 25 kiloVolts and all street light poles;
- The utility demands an "Initial Review Process" during which time NextG must deliver the "actual working Device" proposed for attachment for "testing" by the utility (at a rate of $70 per hour); and
- The utility demands the "immediate removal" of any wireless device that "causes local residents or business owners to express discontent" about their placement on a pole.[7]

To date, the utility has stridently refused to alter *any* of these terms. This is the environment in which NextG operates each day – in which pole owners routinely ignore the

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[6] *Wireless Telecommunications Bureau Reminds Utility Pole Owners of Their Obligations to Provide Wireless Telecommunications Providers with Access to Utility Poles at Reasonable Rates*, Public Notice, 19 FCC Rcd. 24930 at 1 (Wireless Telecom. Bureau 2004) ("Public Notice").

[7] NextG has not yet signed the utility's agreement. Because NextG maintains a politically sensitive relationship with such pole owners, it is constrained in its ability to be more specific at this time. Moreover, utilities commonly require NextG to sign non-disclosure agreements as a condition of even being provided a copy of the utility's agreement terms, thus further constraining NextG's discussion here. If the Commission specifically requests that NextG share this agreement, NextG will do so.

Commission's broad policy statements regarding wireless attachments and pole attachment precedent in blatant disregard of the rights afforded attachers by Section 224.

III. THE COMMISSION SHOULD MAINTAIN REGULATED POLE ATTACHMENT RATES FOR WIRELESS ATTACHMENTS AND ADOPT A RATE FORMULA

With respect to the pole attachment rate that should apply to wireless devices, the Commission has requested comment on

> whether, when they are "telecommunications carriers," wireless providers are entitled to the telecom rate as a matter of law, or whether we should adopt a rate specifically for wireless pole attachments. For example, if a wireless facility uses more than the presumptive one foot of space, could the per-foot rate simply be doubled, trebled, or otherwise multiplied as required.[8]

A. The Commission's Prior Rulings on Wireless Pole Attachment Rates

The question of whether wireless devices qualify as "attachments" under Section 224 – and, therefore, subject to regulated attachment rates – was settled a decade ago by the Commission. In 1998, the Commission ruled that "Wireless carriers are entitled to the benefits and protections of Section 224,"[9] and noted that wireless attachments may include "an antenna or antenna clusters, a communications cabinet at the base of the pole, coaxial cables connecting antennas to the cabinet, concrete pads to support the cabinet, ground wires and trenching, and wires for telephone and electric service."[10] That determination was upheld by the United States Supreme Court in 2002.[11] Thus, the question of whether wireless devices attached by NextG to provide its telecommunications service are "entitled to the telecom rate as a matter of law" has

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8 NPRM at ¶ 34.

9 *Amendment of the Commission's Rules and Policies Governing Pole Attachments*, 13 FCC Rcd. 6777 at ¶ 39 (1998).

10 *Id.* at ¶ 41.

11 *National Cable & Telecom. Ass'n v. Gulf Power Co.*, 534 U.S. 327 (2002).

already been resolved. Section 224 mandates that NextG and others are entitled to attach at regulated rates.

Specifically with respect to pole attachment rates applicable to wireless devices, in 2003 the Enforcement Bureau refused to allow PECO Energy to impose an exorbitant rental fee ($2,100 per year) for wireless attachments, and instead ordered the utility to "provide Omnipoint [now T-Mobile] access to its facilities at just and reasonable rates in accordance with the Pole Attachment Act and the Commission's rules."[12] Further, the Enforcement Bureau ordered PECO Energy to "provide Omnipoint with historical cost data related to the specific facilities to which Omnipoint seeks attachment."[13] In December 2004, the Wireless Telecommunications Bureau issued a public notice "reminder" to utility pole owners of the Commission's prior rulings and their obligation to provide wireless telecommunications providers with access to poles at reasonable rates, stating:

> section 224 and the Commission's rules do not allow pole access fees to be levied against wireless carriers in addition to the statutory pole rental rate, which is based on the space occupied by the attachment and the number of attaching entities on the pole, together with reasonable make-ready fees. Such overcharges ... for wireless pole attachments may have serious anticompetitive effects on telecommunications competition."[14]

The Commission should maintain its long-standing interpretation – consistent with Section 224 and affirmed by the U.S. Supreme Court – that wireless devices are entitled to *regulated* pole attachment rates. As discussed below, to the extent that the issue is the amount of usable pole space actually occupied, then NextG agrees that the Commission's existing formula

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12 *Omnipoint Corp. v. PECO Energy Co.*, Memorandum Opinion and Order, 18 FCC Rcd. 5484 at ¶ 7 (Enf. Bur. 2003).

13 *Id.*

14 Public Notice at 1.

can and must be applied, with the actual number feet of occupied usable space applied. The use of more than one foot does not alter the fundamental premises of the Commission's rate formula.

B. NextG's Experience with Pole Attachment Rates

Despite the Commission's repeated rulings and "reminders" that utilities are required to charge historic, cost-based pole attachment fees for wireless devices, NextG's first-hand experience across the country is that these rulings often are being ignored by utilities. Although some utilities have employed a cost-based formula, typically the telecom rate multiplied by the number of feet occupied by the attached devices, NextG has encountered others who seek to impose fees that clearly have no relation whatsoever to the utility's costs of owning and maintaining a pole. As discussed above, multiple utilities have referred NextG to their non-regulated "business development" group, which demand exorbitant "market" based rates that have no relation to pole costs and instead, are clearly intended to extract the maximum possible monopoly pole rents from third party attachers.[15] Essentially, these "business development" groups attempt to force NextG to pay profit-based attachment rates modeled after the rates the utility charges for attachment of full-blown cell sites to unregulated transmission towers. Several electric utilities across the United States impose annual attachment fees of $1,200 per pole or more for wireless attachments. Again, these annual fees bear no relation to the cost of owning and maintaining a utility pole whose depreciated cost to the utility may only be a few hundred dollars. Further, this sort of "market based rate" model by investor-owned utilities ("IOUs") has a ripple effect that extends to other pole owners that are not subject to Section 224, such as municipal utilities. These entities base their rates on what their neighboring IOUs have extracted

[15] Given that there is no competitive market for utility poles – the fundamental premise for Section 224 – this "market rate" nomenclature used by the utilities is grossly misleading and inapplicable.

and because they are unregulated, there is no recourse. Unfortunately, the unreasonable demands of some electric utilities has interfered with NextG's ability to market and deploy its telecommunications service.

Reinforcing the need for the Section 224 rate regulation, NextG theoretically could install its own pole for less than paying some of the utilities' demands. However, state and local government officials generally either outright prohibit the installation of new poles or would strongly oppose their installation. Accordingly, what the utilities are doing is leveraging their monopoly right to own utility poles. Section 224 was adopted precisely to prohibit such abuse.

C. NextG's Proposed Rate Rule for Wireless Attachments

The Commission has requested comment on "whether [it] should adopt a rate specifically for wireless pole attachments."[16] In light of the foregoing, NextG submits that the Commission should expressly order a straight-forward rate formula that applies to wireless attachments: the utility's wireline telecom pole attachment rate multiplied by the number of feet of usable space actually occupied by the wireless attachment.[17] The Commission should further clarify that usable "space occupied" by a wireless device does not include cables running between the antenna and the equipment box because this space is available for other attachments. Such an approach is consistent with Commission precedent,[18] and fairly compensates utilities for any additional pole space occupied by the wireless device beyond the one-foot presumption.

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16 NPRM at ¶ 34.

17 This approach is consistent with the Commission's previous statements that the pole attachment formula presumptions may be modified or adjusted in order to address unique attachments associated with wireless systems. *See Omnipoint Corp. v. PECO Energy Co.*, Memorandum Opinion and Order, 18 FCC Rcd. 5484 at n. 20 (Enf. Bur. 2003); *Implementation of Section 703(e) of the Telecommunications Act of 1996*, 13 FCC Rcd. 6777 at ¶ 42 (1998).

18 *See Texas Cablevision Co. v. Southwestern Electric Power Co.*, 1985 FCC LEXIS 3818 at ¶ 6 (1985).

The Commission asked in the NPRM "if a wireless facility uses more than the presumptive one foot of space, could the per-foot rate simply be doubled, trebled, or otherwise multiplied as required?"[19] There is no need or basis to establish a new "per-foot" rate applicable to wireless attachments. The approach suggested by NextG is far more straight-forward and requires no additional rate computation beyond the simple process of multiplying the utility's already available per-foot pole rate by the number of feet of usable pole space occupied.

D. Pole Top Attachments Should Not Result in a Higher Rate of Compensation

The Commission asks "should pole owner receive a higher rate of compensation [for pole top attachments], because unlike lateral space, each pole has only one top?"[20] For several reasons, the answer to this question is "no." First, for computing pole attachment rates, Section 224 mandates that to be "just and reasonable," a rate must be based on the amount of space used and the utility's actual, historic costs.[21] Nothing about the use of the pole top changes the utility's cost to own and maintain the pole or the amount of space occupied by the attachment. The Commission has no authority under the Communications Act to deviate from the cost-based rate approach mandated by Congress in Section 224, and certainly not to effectively "de-regulate" attachment rates based on their location on the pole. There simply is no basis in Section 224 and no precedent in the Commission's orders or pole attachment case law for a "higher rate of compensation" for devices attached near at or near the top of a pole.[22] Such an

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19 NPRM at ¶ 34.

20 NPRM at ¶ 34.

21 *See* 47 U.S.C. § 224(d)(1) (For computing pole rates, the "actual capital costs of the utility attributable of the entire pole" must be used.).

22 Indeed, the Commission cited NextG's Comments filed in the *Fibertech Networks Petition* proceeding in support of this assertion. But in those Comments, NextG simply asked the Commission to establish a presumption that pole top access should be permitted. Nothing in

approach would be an open invitation for utilities to demand exorbitant, monopoly rates, and thereby either result in a financial windfall for utilities or effectively deny NextG and others access to pole tops.

In addition, adopting a theory that imposed attachment rates based on some perceived "value" of the pole location would have vast effects that would undermine the longstanding policies underlying Section 224 and the Commission's rules. For example, the imposition of unregulated rates for pole top attachments would mean that wireless attachers would be subsidizing other third party attachers by providing a significant cost recovery by the utility. Such a subsidy, presumably, should result in a decreased rate for all other attaching entities. Indeed, in many cases, utilities seek to impose pole top rates that exceed their costs. In such cases, should all other attaching parties attach for free, at the expense of the wireless attachment? Likewise, utilities themselves frequently attach facilities to the tops of poles. If the theory is true that such pole tops are somehow more valuable, then the utility should be required to apportion to itself a greater "rate" for attachment and all other attaching entities should pay less. Similarly, a theory that attributed "value" to a particular spot on a pole and attempted to adjust rental rates accordingly should then lead to an increased rate for ILECs who are permitted to attach their lines at the lowest point – which is generally considered a more favorable (or "valuable") position because it is easier for technicians to access. These examples illustrate how any attempt to ascribe "value" to parts of the pole would be antithetical to and radically disrupt decades of pole attachment law and policy.

In reality, the top portion of the pole is no more unique than any other portion of the pole. For any particular space on a pole, once it is occupied by an attachment, that space is no longer

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those Comments can be reasonably read to support the notion that a pole top is "unique" or that utilities should be permitted to charge higher rates for pole top attachments.

available for other attachments. But this is equally the case for pole tops as well as all other portions of the pole. Indeed, the top of a particular pole is essentially an arbitrary point because pole height can be extended (at the attaching party's expense, typically) by either (a) a pole replacement (*i.e.*, a pole change-out) or (b) the use of pole-top extenders.

The Commission further should keep in mind that while there may be only one top of each pole, unlike wireline attachments that are attached to every pole along a line, wireless attachments will not occupy all or even a significant number of utility poles. For NextG's systems, for example, the antennas and cabinets are typically attached on only 7 percent or less of the total poles utilized in the DAS network. As a result, utilities will not be faced with requests for pole top access on all or even a significant percentage of their poles.

In 1999, the Commission expressly declined to establish a presumption that space above what has traditionally been referred to as "communications space" on a pole may be reserved for utility use only.[23] But declaring the pole top or space above communications space to be "unique" and therefore subject to "market rates" effectively would have precisely the same result. Utilities would wield their monopoly power over poles to the detriment of wireless carriers and telecommunications providers such as NextG and to the detriment of the public.

IV. THE COMMISSION SHOULD PROMULGATE RULES TO ADDRESS SIGNIFICANT PROBLEMS FACING ATTACHERS

As mentioned above, NextG's service requires access to existing utility poles, and other structures in the rights-of-way. While NextG has been able to work cooperatively with most utilities, unfortunately, it also has faced numerous obstacles to the placement of its facilities on utility poles – most of which appear to stem from the fact that some of the facilities that NextG

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[23] See *Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers*, Order on Reconsideration, 14 FCC Rcd. 18049 at ¶ 72 (1999).

seeks to install are "wireless." The mere fact that the technology involved is wireless too frequently leads to claims that the attachment is "unregulated." These barriers to entry have been erected by utility pole owners in disregard of NextG's rights to access utility poles as a telecommunications provider, even if some of the equipment will be "wireless" or wireless-related.

The *status quo* simply is not working. While the Commission has announced its policies with respect to wireless attachments in various orders, one adjudicatory proceeding and a public notice, it is clear that more must be done because utilities in many cases are ignoring these orders. A set of wireless-specific attachment rules is needed in order to eliminate ambiguity and to clearly identify the rights of attachers using wireless facilities and the obligations of utility pole owners with respect to wireless attachments. By adopting the proposed rules set forth below by NextG, the Commission will eliminate barriers to the deployment of new telecommunications services, as well as wireless or wireless-related broadband services and facilities.

A. The Commission Should Adopt a Rule Establishing A Presumption Allowing Pole Top Attachments

A significant issue for NextG and wireless attachers is the opportunity to place antennas at or near the top of the pole. For NextG, there are several reasons why this is a particularly important issue. Pole top placement of antennas provides greater coverage by the simple fact that it is higher than a mid-pole attachment, which provides better coverage. By increasing the coverage area, increased antenna height, in turn, may significantly reduce the total number of

antennas needed for an installation, thereby decreasing total network cost and minimizing the potential community "impact."[24]

As a threshold matter, the Commission should recognize that attachment of wireless facilities to the top of utility poles can be accomplished safely, consistent with recognized engineering standards, and without any negative impact on reliability. For example, the NESC contains rules that govern the placement of wireless antennas on pole tops. For example, Rule 235I prescribes clearance specifications between antennas attached in the supply space and electrical conductors.[25] The same rule also ensures that "[c]ommunications antennas located in the supply space [be] installed and maintained only by personnel authorized and qualified to work in the supply space. ..."[26] NESC Rules 222 (Joint Use Structures), 224A (Communications circuits located within the supply space and supply circuits located within the communications space), 230A(3)-(4) (Measurement of clearance and spacing; Rounding of calculation results).[27] Rules 236-238 (Climbing Space; Working Space and Vertical clearance between certain communications and supply facilities located on the same structure) also apply to wireless

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[24] NextG frequently encounters opposition or difficulty from local governments. In many communities, each of its Node attachments to utility poles, simply because they involve a wireless device, are subject to complex, burdensome, lengthy, and wholly discretionary "zoning" approvals. While NextG believes that many of these municipal processes are preempted by Section 253 of the Communications Act, 47 U.S.C. § 253, nonetheless, they are far too frequent, and thus, since denial of access to pole tops could double of the number of Nodes subject to zoning and at the same time double the "impact" that will be identified by local authorities it poses an multi-layered potential barrier to NextG's deployment.

[25] *See* Attachment 2, NESC Rule 235I(2)-(4).

[26] *See* Attachment 2, NESC Rule 235I(1).

[27] *See* Attachment 2, NESC Rules 222, 224A, 230A(3)-(4).

attachments, as do all of the loading and strength rules in Sections 24-26 and all of the worker safety rules in Sections 42-44, among others.[28]

In the Public Notice released in 2004, the Wireless Telecommunications Bureau reminded pole owners that pole top attachments cannot be categorically prohibited, but the fact remains that many utilities continue to resist or severely restrict pole top placement. Utilities typically attempt to justify these denials of access on the basis of nebulous and meritless safety concerns.

Based on the refusal of utilities to heed the Commission's Public Notice and holding in its 1999 Order, NextG respectfully submits that the Commission should adopt a specific, explicit rule establishing a presumption that pole top attachments for wireless devices are allowed. To rebut the presumption as to a specific attachment to a specific pole, a pole owner should be required to obtain an order from the Commission based on conclusive evidence holding that a proposed attachment to a particular pole cannot be accomplished because of insufficient capacity or safety, reliability, and generally applicable engineering purposes that cannot be remedied through make-ready, pole expansion or change-out at the attaching party's expense, or other engineering solutions that are acceptable under generally applicable engineering or safety standards. Such a presumption would be rebuttable on a case-by-case, pole-by-pole basis. It would not necessarily give providers advance approval for the attachment of wireless devices on every utility pole. However, it would eliminate the ability of utilities to impose

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[28] *See* Attachment 2, NESC Rules 236-238; Attachment 3, Declaration of David Marne, submitted to the New York Public Service Commission with NextG's comments in the NY PSC's *Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles*, NY PSC Case No. Case 07-M-0741 (filed Sept. 10, 2007); Attachment 4, Reply Declaration of David Marne, submitted to the Commission by NextG in the FCC complaint proceeding *NextG Networks of NY, Inc. v. Public Service Electric & Gas Co.*, File No. EB-07-MD-004 (filed Feb. 11, 2008).

blanket/categorical objections to pole top attachments. NextG recognizes that utility poles come in a variety of sizes and configurations. However, NextG can adjust its attachment designs to accommodate the different pole characteristics in a manner that complies with governing standards, including the NESC.

Moreover, beyond pole top attachments, NextG submits that the Commission should create a presumption that wireless antennas and equipment that comply with governing regulations and applicable standards, such as the NESC, in general, must be presumed safe and permitted, subject to pole-by-pole evaluation.[29] If a utility seeks to impose a standard that goes beyond the NESC, the pole owner should bear the burden of explaining to the provider, and ultimately to the Commission, why they have adopted a stricter practice than the NESC. Such a policy is needed to prevent categorical denials of access to utility distribution poles and the imposition of arbitrary and burdensome standards beyond those of the NESC and other governing codes and regulations. Moreover, such a presumption would put wireless attachments on the same footing as wireline attachments. Currently, utilities are still fighting the idea that wireless attachments should be permitted *at all.* To promote the deployment of wireless broadband, advanced services, and expanded competitive service, the Commission should once and for all make clear that wireless attachments must be presumed permitted.

Indeed, the Commission should also adopt a rule clarifying that attachment in the "supply space" must be permitted if consistent with NESC standards. For example, as part of its DAS networks, NextG must install fiber-optic lines. In some cases, in order to avoid costly make-ready or general congestion in the so-called "communications space," NextG has proposed to install all-dielectric self supporting ("ADSS") fiber-optic lines in the "power space." ADSS fiber

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[29] *See* Attachment 2, NESC Rule 235I and Table 235-6.

is "self supporting," meaning that it does not require an underlying metal strand wire. As a result, it has been commonly installed by electric utilities themselves close to electric lines without the clearance required for standard fiber-optic attachments. Despite the fact that the utilities themselves have deployed ADSS fiber, in some cases for their telecommunications subsidiary, NextG has encountered resistance to its use of ADSS fiber. Essentially, this reflects two important problems. First, electric utilities too often view the "power space" as their sole province, and indeed beyond the regulatory reach of the FCC. An example of this is the insistence by one major electric utility located in the southeastern U.S. (discussed above in Section I(B)) that it has exclusive access to the top 11 feet of every distribution pole. This particular utility maintains this position – in an FCC regulated state – despite the fact that the FCC has previously announced that the "power space" cannot be categorically excluded from attachment. Second, by forcing all communications companies into the "communications space," utilities can develop additional revenue from marked-up make-ready charges and can essentially create the capacity issues that they then use to argue to the Commission and courts for increased, deregulated rates.

While no company should be forced to use ADSS fiber, if in a particular situation NextG or any other attaching entity desires to use ADSS fiber, the utility should be specifically prohibited from denying access for or use of ADSS fiber in the "power space" on poles. The Commission's previous holdings have proven inadequate, and a specific rule is necessary to protect attaching parties' rights.

B. The Commission Should Adopt Rules Mandating the Timely Performance of Preconstruction Surveys and Completion of Make-Ready Work

NextG also has had significant difficulties with pole owners on issues of performing preconstruction surveys and completing make-ready work. In one situation, NextG paid the

utility for make ready work on fourteen sites. However, the utility refused or failed to perform the work until ***six months later***, and then only after contact from NextG's attorney. This project involved only fourteen poles – not hundreds or thousands – and yet the utility refused to provide NextG any clear timeline for completion of make ready.

There is only one FCC rule that addresses make-ready intervals, 47 C.F.R. § 1.1403(b), which requires utilities to respond to requests for access within 45 days. There are no explicit rules that address intervals for completing make-ready or performing preconstruction surveys. Utilities take advantage of these gaps in the rules and often maintain a lackadaisical (or worse) attitude with respect to performing surveys and completing make-ready (even after receiving full payment in advance). NextG submits that in order to remedy this situation the Commission should promulgate rules that require utilities (1) to perform preconstruction surveys within 45 days of the application filing date and (2) to complete make-ready work within 45 days of the date payment is received by the pole owner.[30] These intervals are consistent with those established by the New York Public Service Commission after a comprehensive proceeding that included the participation of pole owners and third party attachers.[31] These intervals are reasonable and yet, will not permit utilities to needlessly delay the implementation of NextG's DAS installations for the benefit of wireless carriers and the public.

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[30] As discussed below, the Commission should also adopt a specific rule requiring utilities to allow attaching parties to use qualified contractors to perform the work, thus eliminating any claim that the utility lacks sufficient staff to act in these timeframes.

[31] *Proceeding on Motion of the [New York Public Service] Commission Concerning Certain Pole Attachment Issues*, NY PSC Case 03-M-0432, Order Adopting Policy Statement on Pole Attachments, Appendix A at 3-4 (Aug. 6, 2004). The New York PSC has an on-going proceeding to determine if these intervals should apply to wireless attachments. *See Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles*, NY PSC Case 07-M-741.

C. The Commission Should Adopt a Rule Permitting the Installation of Equipment Boxes in Unusable Space

In NextG's experience, some utilities continue to categorically refuse to allow NextG, and presumably other wireless attachers, to attach equipment boxes to poles. There is no valid safety or engineering basis for the refusal. The NESC again has rules that address appropriate working space and climbing space and as long as those rules can be met, such attachments should be permitted. In its 1998 order declaring wireless devices to be "attachments," the Commission noted that wireless attachments may include "a communications cabinet at the base of the pole" [32] And NESC Rule 235I(3) expressly permits the attachment of equipment boxes that support a communications antenna.[33] The Commission has recognized that it is standard industry practice to attach such equipment boxes, and that equipment located in unusable space is excluded from the one foot allocation.[34]

Of course, some utilities who refuse to allow NextG to install equipment boxes have installed similar equipment of their own on the poles – including wireless equipment for use in remote meter reading – or permit the attachment of equipment to poles, particularly in the unusable space. Indeed, the attachment of equipment to poles has been standard industry

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[32] 13 FCC Rcd. 6777 at ¶ 41; *see also*, Public Notice (stating "the Commission [has] determined that wireless telecommunications providers are entitled to the benefits and protections of section 224 for the attachment to utility poles of antennas or antenna clusters and ***associated equipment***." (emphasis added)).

[33] *See* Attachment 2, NESC Rule 235I(3) ("The clearance between an equipment case that supports a communications antenna and a supply line conductor shall not be less than the value given in Table 235-6, Row 4a.").

[34] *See, e.g., Texas Cablevision Co. v. Southwestern Elec. Power Co.*, 1985 FCC LEXIS 3818 at ¶ 6 (1985) ("[I]n adopting a standard one foot for space deemed occupied by the cable itself, the Commission not only included that space occupied by the cable itself, but also the space ***associated with any equipment normally required*** by the presence of the cable television attachment. ... Moreover, to the extent that this ancillary equipment may occupy the 18-28 feet designated as "ground clearance," which by definition is excluded from the usable space, it is deemed to be omitted from any measurements" (emphasis added)).

practice. ILECs and cable operators historically have attached equipment boxes of various size and purpose. Verizon and AT&T, in particular, have attached large equipment boxes to utility poles as part of their recent fiber deployments Thus, the limitations on equipment attachment imposed by some utilities – purportedly on the basis of nebulous concerns about safety – are unfounded.

NextG respectfully submits, therefore, that the Commission should adopt a rule establishing a presumption that equipment related to telecommunications attachments is allowed on utility poles. To rebut the presumption, a pole owner should be required to obtain an order from the Commission that as to specific equipment on a particular pole there is conclusive evidence of insufficient capacity, or safety, reliability, and generally applicable engineering purposes that cannot be remedied through engineering solutions that are acceptable under generally applicable engineering or safety standards.

D. The Commission Should Adopt a Rule Permitting Qualified Electrical Workers to Perform Make-Ready and to Install and Maintain Wireless Attachments

NextG has encountered difficulties with some electric utilities that require the use of their own employees to perform pole surveys, make-ready work and to install and maintain wireless attachments. This creates significant problems of delay for NextG and adds unnecessary cost to the overall installation. Where such a delay is likely, NextG would like to use qualified electrical contractors, in accordance with NESC Rule 235I(1) ("Communications antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space ... ."). The utilities' policies flatly conflict with the Commission's ruling regarding the use of qualified electrical workers:

> a utility may require that individuals who will work attaching or making ready attachments of telecommunications ... facilities to utility poles, in the proximity of electric lines, have the same qualifications, in terms of training, as the utility's

own workers, but ***the party seeking access will be able to use any individual workers who meet these criteria.***[35]

In light of some utilities' failure to heed this Commission precedent, NextG submits that the Commission should promulgate a rule expressly permitting the use of qualified electrical contractors, and clarify that the rule applies to wireless devices and related equipment, as well as wireline attachments.

E. The Commission Should Adopt a Rule Prohibiting Utilities from Declaring Street Light Poles And Distribution Poles With "Primary" Attachments "Off Limits" to Wireless Attachments

NextG has encountered certain utilities that categorically and arbitrarily deny access to a large portion of their utility poles for the attachment of wireless devices. While the Commission has ruled that while Section 224 does not apply to transmission towers and or poles carrying only interstate transmission facilities, federal law affords attaching parties non-discriminatory access to distribution poles and transmission poles when they are utilized in the local distribution network.[36] Nonetheless, some utilities are ignoring the Commission's rulings and imposing severe limitations on the universe of poles that are available for wireless attachments. For example, a major utility in the northeast will not permit pole top attachments on any pole with facilities carrying more than 600 Volts, which NextG estimates comprises roughly 85 to 90 percent of the utility's poles. As another example, a major electric utility in the southeastern U.S. (*see* Section I(B)) arbitrarily defines "distribution poles" as only those poles with facilities

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[35] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Interconnection between Local Exchange Carriers and CMRS Providers*, Order on Reconsideration, 14 FCC Rcd. 18049 at ¶ 86 (1999) (emphasis added).

[36] *See Omnipoint Corp. v. PECO Energy Co.*, Memorandum Opinion and Order, 15 FCC Rcd. 5484 at n. 18 (2003) ("We note that PECO argues that attachments to its transmission facilities are not covered by the Pole Attachment Act. We agree with PECO, but only to the extent that the transmission facilities are interstate and not part of a local distribution system."); *Southern Company v. FCC*, 293 F.3d 1338, 1345-1346 (11th Cir. 2002).

transporting electricity of 25 kiloVolts or less, and categorically denies access to all other poles. Other utilities have denied NextG's requests to attach wireless facilities to street light poles, or requested exorbitant unregulated rental rates for such attachments, although such poles are ideal for wireless facilities and can safely accommodate communications antennas.[37] Thus, the practical effect of such policies is to deny NextG access to the a large portion of the universe of majority of its poles and also to deny access to taller poles, which generally are more desirable for antenna placement.

These restrictions are arbitrary and unlawfully limit NextG's access to utility poles that should be available for attachments. The NESC is the primary standard governing the attachment of wireless service facilities to utility poles and certainly constitutes "generally applicable engineering standards" as determined by the Commission. Contrary to the policies of some utilities, the NESC ***expressly permits*** the attachment of "communications antennas in the supply space" on poles with conductors carrying voltages of ***up to 814 kV***.[38] Moreover, NESC Rule 235I(1) requires that "Communications antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space" – *i.e.*, utility technicians or qualified contractors – so it cannot be reasonably argued that such policies are necessary to ensure worker safety. Finally, NextG notes that FERC Account 364 (poles, towers and fixtures), the primary investment account used to compute pole attachment rates, includes not only wood poles, but also poles made of "steel, concrete, or other materials."[39]

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[37] *See* Attachment 5, a NextG DAS antenna attached to a street light pole in Del Mar, California.

[38] *See* Attachment 2, NESC Rule 235I and Table 235-6 (line 1b) (emphasis added).

[39] *See* 18 C.F.R. § 364.

Thus, street light poles, which often are made of steel, are no different than traditional wood poles.

In light of these utility abuses, the Commission should promulgate a rule specifying that all poles owned by a utility (except those carrying only interstate transmission facilities) are presumptively available for wireless attachments. To rebut the presumption, a pole owner should be required to obtain an order from the Commission based on conclusive evidence that a particular proposed attachment to a particular pole is unsuitable for attachment based on conclusive evidence of safety, reliability, and generally applicable engineering problems that cannot be remedied through engineering solutions that are acceptable under generally applicable engineering or safety standards.

F. The Commission Should Establish a Presumption That Wireless Attachments That Comport with the NESC and FCC and OSHA Regulations May Not Be Denied on the Basis of Safety or Reliability

In its dealings with utilities throughout the country, NextG has encountered a host of nebulous, unfounded objections to its proposed wireless attachments, typically on the basis of alleged concerns about: (i) clearances between antennas and power lines; (ii) RF emissions; (iii) pole loading; (iv) wind, snow and ice loading; and (v) climbing and working space. However, each of these concerns is already adequately addressed in the NESC and/or FCC and Occupational Health and Safety Administration ("OSHA") regulations.

As discussed above, **clearances** between power lines and communications antennas, as well as between equipment boxes and power lines are already addressed by the NESC and are not legitimate grounds for excluding wireless facilities. The NESC expressly addresses clearance requirements for the attachment of pole top antennas and other communications equipment located in the supply space. For instance, NESC Rule 235I governs "[c]learances in any direction from supply line conductors to communication antennas located in the supply

space [*i.e.*, pole top] attached to the same supporting structure."[40] Similarly, NESC Rule 239H controls the "[r]equirements for vertical communication conductors passing through supply space on jointly used structures."[41] NESC Rule 235I(1) further requires that "[c]ommunications antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space. ... ."[42] Consequently, as long as the "authorized and qualified personnel" install the antennas and other facilities in accordance with these rules, clearance issues are adequately addressed.

Pole owners sometimes raise alleged concerns about worker exposure to **RF emissions**. Such assertions are unfounded because the safety of RF emissions from wireless attachments already is subject to comprehensive regulation by the Commission and OSHA.[43] The Commission's standards are based substantially on the recommendations of the U.S. Environmental Protection Agency and the Food and Drug Administration, and reflect "the best scientific thought" on the RF limits necessary to "protect the public health."[44] These standards protect the public and utility workers from any RF emissions from wireless devices attached to utility poles. So long as a wireless attachment is within the Commission's standards for maximum permissible exposure for general population uncontrolled exposure, utilities must be prohibited from citing RF emissions as grounds for denying access.

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40 *See* Attachment 2, NESC Rule 235I.

41 *See* Attachment 2, NESC Rule 239H

42 *See* Attachment 2, NESC Rule 235I(1).

43 *See* 47 C.F.R. § 1.1310 (FCC RF emissions rules); FCC Office of Engineering and Technology Bulletins 56 and 65; 29 C.F.R. §§ 1910.97 and 1910.268 (OSHA regulations).

44 *See Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Report and Order, 11 FCC Rcd. 15123 at ¶ 2 (1996).

Concerns about **pole loading** due to wireless attachments are unfounded because the impact of antennas and associated equipment on a pole's strength and loading is significantly less than that created by overhead power lines and related power equipment. Utility concerns about the effect of **snow, ice and wind** are equally baseless. Any wind and ice loading issues raised by the attachment of antennas are addressed by the NESC and are no different than issues incident to any other type of pole attachment. There is nothing special about NextG's antennas and equipment boxes simply because they are "wireless." The attachment of wireless antenna on pole tops are covered by designing the antenna attachment using hardware of sufficient capacity to support the antenna during weather conditions addressed in the NESC. The NESC takes into account the weather conditions prevalent where the pole is located. Specifically, Section 25 of the NESC, titled "Loadings for Grades B and C," defines the physical loads (*i.e.*, ice, wind and temperature conditions) that facilities attached to utility poles must be able to withstand and the load factors that apply.[45] In short, any pole loading issues raised by the attachment of wireless devices are addressed by adherence to the NESC.

Moreover, wind, snow, and ice loading are no more an issue for wireless equipment than they are for wireline. Indeed, as demonstrated by studies performed by an NESC expert for NextG, the wind loading impact of NextG's antennas is significantly less than the wire spans attached between nodes.[46] If there are loading issues, they can be dealt with on a pole specific

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[45] NESC Rule 250B establishes three general degrees of loading due to prevailing weather conditions, specifically the combined effect of ice and wind. NESC Rule 250C establishes extreme wind loading standards for poles taller than 60 feet, while NESC Rule 252 specifies how to apply ice and wind loading on poles and other line supports. In addition, NESC Rule 012C requires consideration of loads caused by the local conditions that may adversely affect the stress on the fasteners, support components, and the supporting structure itself (*i.e.*, the pole). *See* Attachment 2, NESC Rules 012C, 250B, 250C and 252.

[46] *See* Attachment 3, Declaration of David Marne, submitted to the New York Public Service Commission with NextG's comments in the NY PSC's *Proceeding on Motion of the*

basis (*e.g.*, through make-ready or pole change out). There is *no* basis to categorically object to wireless attachments based on alleged loading concerns.

Finally, with respect to **climbing space** and **work space** issues, NESC Rules 236 and 237 ensure that climbing space and work space are adequately maintained.[47] For example, NESC Rule 236D(1) provides that "[a]ll supply and communications equipment ... when located below conductors or other attachments, shall be mounted outside of the climbing space."[48] Moreover, because wireless equipment is no more burdensome to a pole than other equipment already permitted on poles by pole owners (*e.g.*, electric transformers), wireless devices raise no unique issues with respect to climbing and work space.

Thus, NextG requests that the Commission adopt a rebuttable presumption that wireless attachments that comply with the NESC and relevant FCC and OSHA regulations must be permitted on utility poles. Such a rule is needed to prevent unfounded denials of access to utility poles and the imposition of arbitrary standards beyond those of the NESC and other governing codes and regulations, which NextG has experienced all too often.

V. CONCLUSION

Based on the foregoing comments, NextG respectfully submits that the Commission should adopt rules that explicitly recognize and protect wireless attachments, including the following:

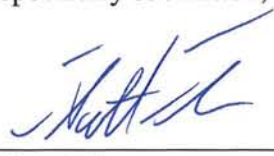
Commission Concerning Wireless Facility Attachments to Utility Distribution Poles, NY PSC Case 07-M-0741 (filed Sept. 10, 2007); Attachment 4, Reply Declaration of David Marne, submitted to the Commission by NextG in the FCC complaint proceeding *NextG Networks of NY, Inc. v. Public Service Electric & Gas Co.*, File No. EB-07-MD-004 (filed Feb. 11, 2008).

47 *See* Attachment 2, NESC Rules 236 and 237.

48 *See* Attachment 2, NESC Rule 236(D)(1).

- a rule that the rate applicable to wireless attachments equals the utility's telecommunications pole attachment rate multiplied by the number of feet of useable space actually occupied by the wireless attachment;
- a rule that pole top attachments must be allowed;
- a rule prohibiting allowing ADSS fiber installation in the "power space" on poles and prohibiting pole owners from categorically prohibiting attachments to any part of the pole where the attachments would comply with NESC standards;
- a rule permitting the installation of equipment boxes in unusable space;
- a rule permitting attaching parties to use any qualified electrical workers to perform make-ready work and to install and maintain attachments, including wireless attachments;
- a rule prohibiting utilities from declaring street light poles and poles with attachments above a certain voltage "off limits" to wireless attachments;
- rules mandating performance of preconstruction surveys and completion of make-ready work within the specific timeframes set forth above; and
- a rule establishing a presumption that wireless attachments that comport with the NESC and FCC and OSHA regulations may not be denied on the basis of safety or reliability.

Respectfully submitted,



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March 7, 2008

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Implementation of Section 224 of the Act; Amendment of the Commission's Rules and Policies Governing Pole Attachments	WC Docket No. 07-245 RM-11293 RM-11303

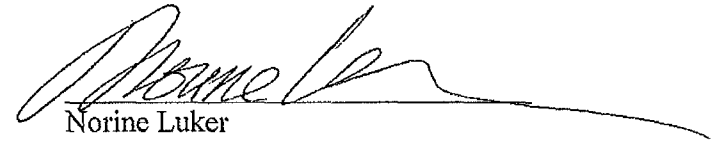
Declaration of Norine Luker

I, Norine Luker, declare and state as follows:

1. I am Senior Director of Utility Administration for NextG Networks, Inc. ("NextG"). My primary duty at NextG is to work with pole owning utility companies to secure NextG's right to attach to utility poles.

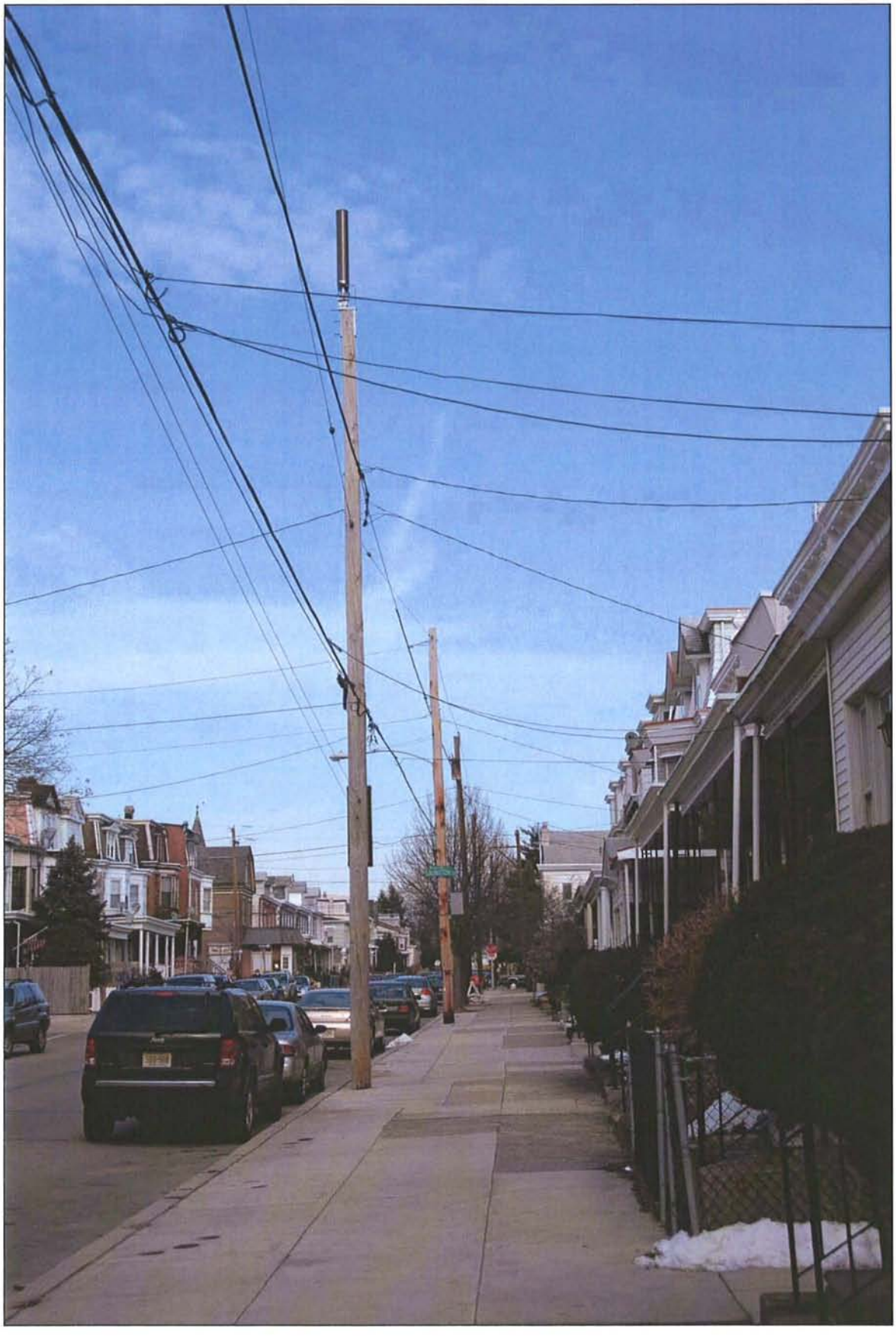
2. I make this Declaration in response to questions posed by the Federal Communications Commission in the captioned proceeding and in support of the Comments of NextG Networks, Inc.

3. I declare that the factual information contained in the Comments of NextG Networks, Inc. ("NextG") with respect to NextG's experiences related to attaching its facilities on utility poles is true and correct to be the best of my belief and knowledge.

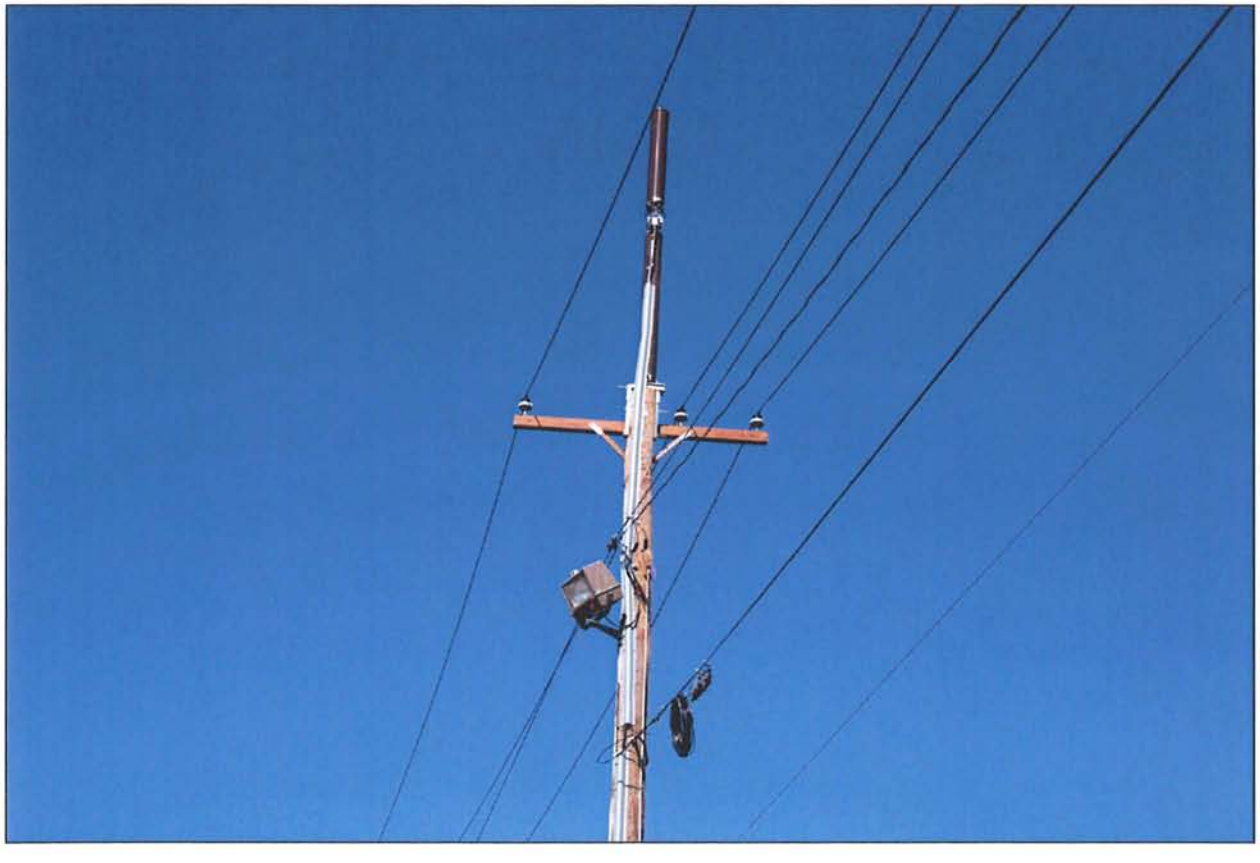


Norine Luker

Attachment 1
Pictures of Representative NextG DAS Installations




SHOP 'N GO
Giggles

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Attachment 2
Pertinent Rules of the
National Electrical Safety Code ("NESC")

Accredited
Standards
Committee
C2-2007

National Electrical Safety Code®

Secretariat
Institute of Electrical and Electronics Engineers, Inc.

Approved 20 April 2006
Institute of Electrical and Electronics Engineers, Inc.

Approved 16 June 2006
American National Standards Institute

2007 Edition

Abstract: This standard covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of (1) conductors and equipment in electric supply stations, and (2) overhead and underground electric supply and communication lines. It also includes work rules for the construction, maintenance, and operation of electric supply and communication lines and equipment. The standard is applicable to the systems and equipment operated by utilities, or similar systems and equipment, of an industrial establishment or complex under the control of qualified persons. This standard consists of the introduction, definitions, grounding rules, list of referenced and bibliographic documents, and Parts 1, 2, 3, and 4 of the 2007 Edition of the National Electrical Safety Code.

Keywords: communications industry safety; construction of communication lines; construction of electric supply lines; electrical safety; electric supply stations; electric utility stations; high-voltage safety; operation of communications systems; operation of electric supply systems; power station equipment; power station safety; public utility safety; safety work rules; underground communication line safety; underground electric line safety

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Section 1.
Introduction to the
National Electrical Safety Code®

010. Purpose

The purpose of these rules is the practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment.

These rules contain the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions. This Code is not intended as a design specification or as an instruction manual.

011. Scope

A. These rules cover supply and communication lines, equipment, and associated work practices employed by a public or private electric supply, communications, railway, or similar utility in the exercise of its function as a utility. They cover similar systems under the control of qualified persons, such as those associated with an industrial complex or utility interactive system.

B. The NESC covers utility facilities and functions up to the service point.

NOTE: The National Electrical Code® (NEC®) (NFPA 70, 2005 Edition)① covers utilization wiring requirements beyond the service point.

C. NESC rules cover street and area lights (supplied by underground or overhead conductors) under the exclusive control of utilities (including their authorized contractors) or other qualified persons (such as those associated with an industrial complex).

NOTE: Luminaires not under such exclusive control are governed by the requirements of the NEC.

D. NESC rules do not cover installations in mines, ships, railway rolling equipment, aircraft, or automotive equipment, or utilization wiring except as covered in Parts 1 and 3.

012. General rules

A. All electric supply and communication lines and equipment shall be designed, constructed, operated, and maintained to meet the requirements of these rules.

B. The utilities, authorized contractors, or other entities, as applicable, performing design, construction, operation, or maintenance tasks for electric supply or communication lines or equipment covered by this Code shall be responsible for meeting applicable requirements.

C. For all particulars not specified in these rules, construction and maintenance should be done in accordance with accepted good practice for the given local conditions known at the time by those responsible for the construction or maintenance of the communication or supply lines and equipment.

013. Application

A. New installations and extensions

1. These rules shall apply to all new installations and extensions, except that they may be waived or modified by the administrative authority. When so waived or modified, safety shall be provided in other ways.

①Information on references can be found in Section 3.

Communication circuits other than those used in connection with the operation of the supply circuits shall not be carried in the same cable with such supply circuits.

f. Where such supply conductors are carried below communication conductors, transformers and other apparatus associated therewith shall be attached only to the sides of the support arm in the space between and at no higher level than such supply wires.

g. Lateral runs of such supply circuits carried in a position below the communication space shall be protected through the climbing space by wood molding or equivalent covering, or shall be carried in insulated multiple-conductor cable, and such lateral runs shall be placed on the underside of the support arm.

C. Relative levels: Supply lines of different voltage classifications (0 to 750 V, over 750 V to 8.7 kV, over 8.7 kV to 22 kV, and over 22 kV to 50 kV)

1. At crossings or conflicts

Where supply conductors of different voltage classifications cross each other or structure conflict exists, the higher-voltage lines should be carried at the higher level.

2. On structures used only by supply conductors

Where supply conductors of different voltage classifications are on the same structures, relative levels should be as follows:

a. Where all circuits are owned by one utility, the conductors of higher voltage should be placed above those of lower voltage.

b. Where different circuits are owned by separate utilities, the circuits of each utility may be grouped together, and one group of circuits may be placed above the other group provided that the circuits in each group are located so that those of higher voltage are at the higher levels and that any of the following conditions is met:

(1) A vertical clearance of not less than that required by Table 235-5 is maintained between the nearest line conductors of the respective utilities.

(2) Conductors of a lower voltage classification placed at a higher level than those of a higher classification shall be placed on the opposite side of the structure.

(3) Ownership and voltage are prominently displayed.

D. Identification of overhead conductors

All conductors of electric supply and communication lines should, as far as is practical, be arranged to occupy uniform positions throughout, or shall be constructed, located, marked, numbered, or attached to distinctive insulators or crossarms, so as to facilitate identification by employees authorized to work thereon. This does not prohibit systematic transposition of conductors.

E. Identification of equipment on supporting structures

All equipment of electric supply and communication lines should be arranged to occupy uniform positions throughout or shall be constructed, located, marked, or numbered so as to facilitate identification by employees authorized to work thereon.

221. Avoidance of conflict

Two separate lines, either of which carries supply conductors, should be so separated from each other that neither conflicts with the other. If this is not practical, the conflicting line or lines should be separated as far as practical and shall be built to the grade of construction required by Section 24 for a conflicting line, or the two lines shall be combined on the same structures.

222. Joint use of structures

Joint use of structures should be considered for circuits along highways, roads, streets, and alleys. The choice between joint use of structures and separate lines shall be determined through

cooperative consideration of all the factors involved, including the character of circuits, the total number and weight of conductors, tree conditions, number and location of branches and service drops, structure conflicts, availability of right-of-way, etc. Where such joint use is mutually agreed upon, it shall be subject to the appropriate grade of construction specified in Section 24.

223. Communications protective requirements

A. Where required

Where communication apparatus is handled by other than qualified persons, it shall be protected by one or more of the means listed in Rule 223B if such apparatus is permanently connected to lines subject to any of the following:

1. Lightning
2. Contact with supply conductors whose voltage to ground exceeds 300 V
3. Transient rise in ground potential exceeding 300 V
4. Steady-state induced voltage of a hazardous level

Where communication cables will be in the vicinity of supply stations where large ground currents may flow, the effect of these currents on communication circuits should be evaluated.

NOTE: Additional information may be obtained from IEEE Stds 487™-2000 [B34] and 1590™-2003 [B54].

B. Means of protection

Where communication apparatus is required to be protected under Rule 223A, protective means adequate to withstand the voltage expected to be impressed shall be provided by insulation, protected where necessary by surge arresters used in conjunction with fusible elements. Severe conditions may require the use of additional devices such as auxiliary arresters, drainage coils, neutralizing transformers, or isolating devices.

224. Communication circuits located within the supply space and supply circuits located within the communication space

A. Communication circuits located in the supply space

1. Communication circuits located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space in accordance with the applicable rules of Sections 42 and 44.
2. Communication circuits located in the supply space shall meet the following clearance requirements, as applicable:
   a. Insulated communication cables supported by an effectively grounded messenger shall have the same clearances as neutrals meeting Rule 230E1 from communication circuits located in the communication space and from supply conductors located in the supply space. See Rules 235 and 238.
   b. Fiber-optic cables located in the supply space shall meet the requirements of Rule 230F.
   c. Open-wire communication circuits permitted by other rules to be in the supply space shall have the same clearances from communication circuits located in the communication space and from other circuits located in the supply space as required by Rule 235 for ungrounded open supply conductors of 0–750 V.

      EXCEPTION: Service drops meeting Rules 224A3a and 224A3b may originate in the supply space on a line structure or in the span and terminate in the communication space on the building or structure being served.
3. Communication circuits located in the supply space in one portion of the system may be located in the communication space in another portion of the system if the following requirements are met:

a. Where the communication circuit is, at any point, located above an energized supply conductor or cable, the communication circuit shall be protected by fuseless surge arresters, drainage coils, or other suitable devices to limit the normal communication circuit voltage to 400 V or less to ground.

NOTE: The grades of construction for communication conductors with inverted levels apply.

b. Where the communication circuit is always located below the supply conductors, the communication protection shall meet the requirements of Rule 223.

c. The transition(s) between the supply space and the communication space shall occur on a single structure; no transition shall occur between line structures.

EXCEPTION: Service drops meeting Rules 224A3a and 224A3b may originate in the supply space on a line structure or in the span and terminate in the communication space on the building or structure being served.

d. The construction and protection shall be consistently followed throughout the extent of such section of the communications system.

B. Supply circuits used exclusively in the operation of communication circuits

Circuits used for supplying power solely to apparatus forming part of a communications system shall be installed as follows:

1. Open-wire circuits shall have the grades of construction, clearances, insulation, etc., prescribed elsewhere in these rules for supply or communication circuits of the voltage concerned.

2. Special circuits operating at voltages in excess of 90 V ac or 150 V dc and used for supplying power solely to communications equipment may be included in communication cables under the following conditions:

a. Such cables shall have a conductive sheath or shield that is effectively grounded, and each such circuit shall be carried on conductors that are individually enclosed with an effectively grounded shield.

b. All circuits in such cables shall be owned or operated by one party and shall be maintained only by qualified personnel.

c. Supply circuits included in such cables shall be terminated at points accessible only to qualified personnel.

d. Communication circuits brought out of such cables, if they do not terminate in a repeater station or terminal office, shall be protected or arranged so that in the event of failure within the cable, the voltage on the communication circuit will not exceed 400 V to ground.

e. Terminal apparatus for the power supply shall be so arranged that the live parts are inaccessible when such supply circuits are energized.

EXCEPTION: The requirements of Rule 224B2 do not apply to communication circuits where the transmitted power does not exceed 150 W.

225. Electric railway construction

A. Trolley-contact conductor fastenings

All overhead trolley-contact conductors shall be supported and arranged so that the breaking of a single contact conductor fastening will not allow the trolley conductor live span wire, or current-carrying connection, to come within 3.0 m (10 ft) (measured vertically) from the ground, or from any platform accessible to the general public.

Span-wire insulation for trolley-contact conductors shall comply with Rule 279B.

Section 23.
Clearances

230. General

A. Application

This section covers all clearances, including climbing spaces, involving overhead supply and communication lines.

NOTE: The more than 70 years of historical development and specification of clearances in Rules 232, 233, and 234 were reviewed for consistency among themselves and with modern practice and were appropriately revised in both concept and content for the 1990 Edition. See Appendix A.

1. Permanent and temporary installations

   The clearances of Section 23 are required for permanent and temporary installations.

2. Emergency installations

   The clearances required in Section 23 may be decreased for emergency installations if the following conditions are met.

   NOTE: See Rule 14.

   a. Open supply conductors of 0 to 750 V and supply cables meeting Rule 230C; and communication conductors and cables, guys, messengers, and neutral conductors meeting Rule 230E1 shall be suspended not less than 4.8 m (15.5 ft) above areas where trucks are expected, or 2.70 m (9 ft) above areas limited to pedestrians or restricted traffic only where vehicles are not expected during the emergency, unless Section 23 permits lesser clearances.

      For the purpose of this rule, trucks are defined as any vehicle exceeding 2.5 m (8 ft) in height. Areas not subject to truck traffic are areas where truck traffic is neither normally encountered nor reasonably anticipated or is otherwise limited.

      Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback, vehicles, or other mobile units exceeding 2.5 m (8 ft) in height are prohibited by regulation or permanent terrain configurations or are otherwise neither normally encountered nor reasonably anticipated or are otherwise limited.

   b. Vertical clearances of open supply conductors above 750 V shall be increased above the applicable value of Rule 230A2a as appropriate for the voltage involved and the given local conditions.

   c. Reductions in horizontal clearances permitted by this rule shall be in accordance with accepted good practice for the given local conditions during the term of the emergency.

   d. Supply and communication cables may be laid directly on grade if they are guarded or otherwise located so that they do not unduly obstruct pedestrian or vehicular traffic and are appropriately marked. Supply cables operating above 600 V shall meet either Rule 230C or 350B.

   e. No clearance is specified for areas where access is limited to qualified personnel only.

3. Measurement of clearance and spacing

   Unless otherwise stated, all clearances shall be measured from surface to surface and all spacings shall be measured center to center. For clearance measurement, live metallic hardware electrically connected to line conductors shall be considered a part of the line conductors. Metallic bases of potheads, surge arresters, and similar devices shall be considered a part of the supporting structure.

4. Rounding of calculation results

Unless otherwise specified in a table or rule within Section 23 that requires a calculation, the resultant of the calculation shall be rounded up to the same level of decimal places as the basic value shown in the rule or table, regardless of the numbers of significant digits of individual values required to be used in the calculation.

EXCEPTION: Rules or tables with values in millimeters are shown in units of 5 mm; as a result, resultants of calculations to be expressed in millimeters shall be rounded up to the next multiple of 5 mm.

EXAMPLES: If the basic value shown in a rule or table has no decimal places, such as 3 in, the resultant will be rounded up to the next whole number. If the basic value shown in the table or rule is shown as having one decimal place, such as 18.5 ft, the resultant of the calculation will be rounded up to one decimal place. If the table or rule contains a basic value expressed in two decimal places, such as 1.27 m, the resultant will be rounded up to two decimal places.

B. Ice and wind loading for clearances

1. Three general degrees of loading due to weather conditions are recognized and are designated as clearance zones 1, 2, and 3. Figure 230-1 shows the zones where these loadings apply.

NOTE: The localities are classified in the different zones according to the relative simultaneous prevalence of the wind velocity and thickness of ice that accumulates on wires. Zone 3 is for places where little, if any, ice accumulates on wires. See Appendix B.

2. Table 230-1 shows the radial thickness of ice to be used in calculating sags for clearance purposes. See applicable clearance rules in Section 23.

3. Ice and wind loads are specified in Rule 230B1.

a. Where a cable is attached to a messenger, the specified loads shall be applied to both cable and messenger.

b. In determining wind loads on a conductor or cable without ice covering, the assumed projected area shall be that of a smooth cylinder whose outside diameter is the same as that of the conductor or cable. The force coefficient (shape factor) for cylindrical surfaces is assumed to be 1.0.

NOTE: Experience has shown that as the size of multiconductor cable decreases, the actual projected area decreases, but the roughness factor increases and offsets the reduction in projected area.

c. An appropriate mathematical model shall be used to determine the wind and weight loads on ice-coated conductors and cables. In the absence of a model developed in accordance with Rule 230B5, the following mathematical model shall be used:

(1) On a conductor, lashed cable, or multiple-conductor cable, the coating of ice shall be considered to be a hollow cylinder touching the outer strands of the conductor or the outer circumference of the lashed cable or multiple-conductor cable.

(2) On bundled conductors, the coating of ice shall be considered as individual hollow cylinders around each subconductor.

d. It is recognized that the effects of conductor stranding or of non-circular cross section may result in wind and ice loadings more or less than those calculated according to assumptions stated in Rules 230B3b and 230B3c. No reduction in these loadings is permitted unless testing or a qualified engineering study justifies a reduction.

4. Table 230-2 shows the radial thickness of ice, wind pressures, temperatures, and additive constants to be used in calculating inelastic deformation.

The load components shall be determined as follows:

a. Vertical load component

The vertical load on a wire, conductor, or messenger shall be its own weight plus the weight of conductors, spacers, or equipment that it supports, ice covered where required by Rule 230B1 and Table 230-2.

b. Horizontal load component

The horizontal load shall be the horizontal wind pressure determined under Rule 230B1 and Table 230-2, applied at right angles to the direction of the line using the projected area of the conductor or messenger and conductors, spacers, or equipment that it supports, ice covered where required by Rule 230B1 and Table 230-2.

c. Total load

The total load on each wire, conductor, or messenger shall be the resultant of components in a) and b) above, calculated at the applicable temperature in Table 230-2, plus the corresponding additive constant in Table 230-2.

5. Final sag calculations shall include the effects of inelastic deformation due to both (a) initial and subsequent combined ice and wind loading, and (b) long-term material deformation (creep). See applicable **sag** definitions. Ice is assumed to weigh 913 kg/m^3 (57 lb/ft^3).

C. Supply cables

For clearance purposes, supply cables, including splices and taps, conforming to any of the following requirements are permitted lesser clearances than open conductors of the same voltage. Cables should be capable of withstanding tests applied in accordance with an applicable standard.

1. Cables that are supported on or cabled together with an effectively grounded bare messenger or neutral, or with multiple concentric neutral conductors, where any associated neutral conductor(s) meet(s) the requirements of Rule 230E1 and where the cables also meet one of the following:
   a. Cables of any voltage having an effectively grounded continuous metal sheath or shield
   b. Cables designed to operate on a multi-grounded system at 22 kV or less and having semiconducting insulation shielding in combination with suitable metallic drainage
2. Cables of any voltage, not included in Rule 230C1, covered with a continuous auxiliary semi-conducting shield in combination with suitable metallic drainage and supported on and cabled together with an effectively grounded bare messenger.
3. Insulated, nonshielded cable operated at not over 5 kV phase to phase, or 2.9 kV phase to ground, supported on and cabled together with an effectively grounded bare messenger or neutral.

D. Covered conductors

Covered conductors shall be considered bare conductors for all clearance requirements except that clearance between conductors of the same or different circuits, including grounded conductors, may be reduced below the requirements for open conductors when the conductors are owned, operated, or maintained by the same party and when the conductor covering provides sufficient dielectric strength to limit the likelihood of a short circuit in case of momentary contact between conductors or between conductors and the grounded conductor. Intermediate spacers may be used to maintain conductor clearance and to provide support.

E. Neutral conductors

1. Neutral conductors that are effectively grounded throughout their length and associated with circuits of 0 to 22 kV to ground may have the same clearances as guys and messengers.
2. All other neutral conductors of supply circuits shall have the same clearances as the phase conductors of the circuit with which they are associated.

F. Fiber-optic cable

1. Fiber-optic—supply cable
   a. Cable defined as "fiber-optic—supply" supported on a messenger that is effectively grounded throughout its length shall have the same clearance from communications facilities as required for a neutral conductor meeting Rule 230E1.

b. Cable defined as "fiber-optic—supply" that is entirely dielectric, or supported on a messenger that is entirely dielectric, shall have the same clearance from communications facilities as required for a neutral conductor meeting Rule 230E1.

c. Fiber-optic—supply cables supported on or within messengers not meeting Rule 230F1a or 230F1b shall have the same clearances from communications facilities required for such messengers.

d. Fiber-optic—supply cables supported on or within a conductor(s), or containing a conductor(s) or cable sheath(s) within the fiber-optic cable assembly shall have the same clearances from communications facilities required for such conductors. Such clearance shall be not less than that required under Rule 230F1a, 230F1b, or 230F1c, as applicable.

e. Fiber-optic—supply cables meeting Rule 224A3 are considered to be communication cables when located in the communication space.

2. Fiber-optic—communication cable

Cable defined as "fiber-optic—communication" shall have the same clearance from supply facilities as required for a communication messenger.

G. Alternating- and direct-current circuits

The rules of this section are applicable to both ac and dc circuits. For dc circuits, the clearance requirements shall be the same as those for ac circuits having the same crest voltage to ground.

NOTE: Although the corresponding crest voltage for a common sinusoidal ac circuit may be calculated by multiplying its rms value by 1.414 (square root of 2), this may not be appropriate for other type ac circuits. An example of the latter is represented by non-sinusoidal power supplies such as used in some coaxial cable type communication systems.

H. Constant-current circuits

The clearances for constant-current circuits (such as series lighting circuits) shall be determined on the basis of their normal full-load voltage.

I. Maintenance of clearances and spacings

The clearances and spacing required shall be maintained at the values and under the conditions specified in Section 23 of the applicable edition. The clearances of Section 23 are not intended to be maintained during the course of or as a result of abnormal events such as, but not limited to, actions of others or weather events in excess of those described under Section 23.

NOTE: See Rule 13 to determine the applicable edition.

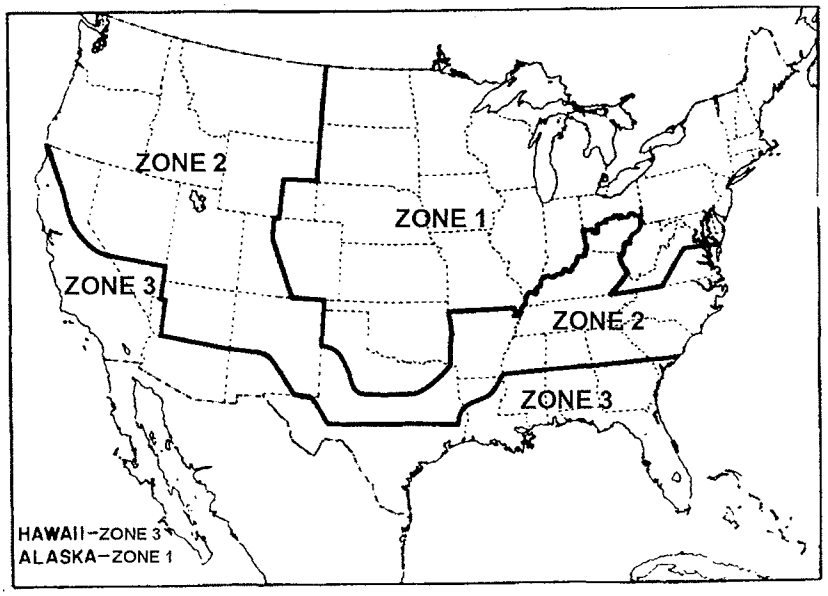


Figure 230-1—Clearance zone map of the United States

Table 230-1—Ice thickness for purposes of calculating clearances

	Clearance zone (for use with Rules 232, 233, 234, and 235)		
	Zone 1	**Zone 2**	**Zone 3**
Radial thickness of ice			
(mm)	12.5	6.5	0
(in)	0.50	0.25	0

Table 230-2—Ice, wind pressures, temperatures, and additive constants for purposes of calculating final inelastic deformation

	Clearance zone (for use with Rule 230B)		
	Zone 1	**Zone 2**	**Zone 3**
Radial thickness of ice			
(mm)	12.5	6.5	0
(in)	0.50	0.25	0
Horizontal wind pressure			
(Pa)	190	190	430
(lb/ft^2)	4	4	9
Temperature			
(°C)	–20	–10	–1
(°F)	0	+15	+30
Constant to be added to the resultant			
(N/m)	4.40	2.90	0.73
(lb/ft)	0.30	0.20	0.05

231. Clearances of supporting structures from other objects

Supporting structures, support arms, anchor guys, and equipment attached thereto, and braces shall have the following clearances from other objects. The clearance shall be measured between the nearest parts of the objects concerned.

A. From fire hydrants

Not less than 1.2 m (4 ft).

EXCEPTION 1: Where conditions do not permit, a clearance of not less than 900 mm (3 ft) is allowed.

3. Conductors shall be arranged so that the vertical spacing shall be not less than that specified in Table 235-8 under the conditions specified in Rule 235C2b(1)(c)
4. A supporting neutral conductor of a supply cable meeting Rule 230C3 or an effectively grounded messenger of a supply cable meeting Rule 230C1 or 230C2 may attach to the same insulator or bracket as a neutral conductor meeting Rule 230E1, so long as the clearances of Table 235-8 are maintained in mid-span and the insulated energized conductors are positioned away from the open supply neutral at the attachment.

H. Clearance and spacing between communication conductors, cables, and equipment

1. The spacing between messengers supporting communication cables should be not less than 300 mm (12 in) except by agreement between the parties involved.
2. The clearances between the conductors, cables, and equipment of one communication utility to those of another, anywhere in the span, shall be not less than 100 mm (4 in), except by agreement between the parties involved.

I. Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

1. General

   Communication antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space in accordance with the applicable rules of Sections 42 and 44. See also Rule 224A.

2. Communication antenna

   The clearance between a communication antenna operated at a radio frequency of 3 kHz to 300 GHz and a supply line conductor shall be not less than the value given in Table 235-6, row 1b.

   NOTE 1: The antenna functions as a rigid, vertical, or lateral open wire communication conductor.

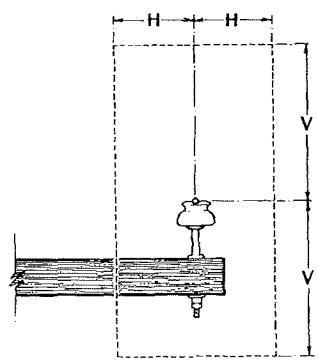
   NOTE 2: See Rule 420Q.

3. Equipment case that supports a communication antenna

   The clearance between an equipment case that supports a communication antenna and a supply line conductor shall be not less than the value given in Table 235-6, Row 4a.

4. Vertical or lateral communication conductors and cables attached to a communication antenna

   The clearance between a supply line conductor and the vertical or lateral communication conductor and cable attached to a communication antenna shall be not less than the value given in Rule 239.



V = Vertical clearance
H = Horizontal clearance

Figure 235-1—Clearance diagram for energized conductor

in

Table 235-6— *(continued)*
Clearance in any direction from line conductors to supports and to vertical or lateral conductors, span, or guy wires attached to the same support
[See also Rules 235E1, 235E3b(2), and 235I.]

Clearance of line conductors from	Communication lines in general (in)	Communication lines on jointly used structures; neutral conductors meeting Rule 230E1 (in)	Supply lines — Circuit phase-to-phase voltage		
			0 to 8.7 kV ⑭ (in)	Over 8.7 to 50 kV (in)	Over 50 to 814 kV ④ ⑨ (in)
4. Surface of structures:					
a. On jointly used structures	—	5 ② ⑥	5 ③ ⑧	5 plus 0.2 per kV in excess of 8.7 kV ⑧ ⑩	13 plus 0.2 per kV in excess of 50 kV
b. All other	3 ② ⑥	—	3 ⑧	3 plus 0.2 per kV in excess of 8.7 kV ⑧ ⑩	11 plus 0.2 per kV in excess of 50 kV

①For guy wires, if practical. For clearances between span wires and communication conductors, see Rule 238C.

On jointly used structures, guys that pass within 12 in of supply conductors, and also pass within 12 in of communication cables, shall be protected with a suitable insulating covering where the guy passes the supply conductors, unless the guy is effectively grounded or insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

The clearance from an insulated or effectively grounded guy to a communication cable may be reduced to 3 in when abrasion protection is provided on the guy or communication cable.

②Communication conductors may be attached to supports on the sides or bottom of crossarms or surfaces of poles with less clearance.

③This clearance applies only to supply conductors at the support below communication conductors, on jointly used structures.

Where supply conductors are above communication conductors, this clearance may be reduced to 3 in.

④All clearances for line over 50 kV shall be based on the maximum operating voltage. For voltages exceeding 814 kV, the clearance shall be determined by the alternate method given by Rule 235E3.

⑤For supply circuits of 0 to 750 V, this clearance may be reduced to 3 in.

⑥A neutral conductor meeting Rule 230E1 may be attached directly to the structure surface.

⑦Guys and messengers may be attached to the same strain plates or to the same through bolts.

⑧For open supply circuits of 0 to 750 V and supply cables of all voltages meeting Rule 230C1, 2 or 3, this clearance may be reduced to 1 in. No clearance is specified for phase conductors of such cables where they are physically restrained by a suitable bracket from abrasion against the pole.

⑨The additional clearance for voltages in excess of 50 kV specified in Table 235-6 shall be increased 3% for each 1000 ft in excess of 3300 ft above mean sea level.

⑩Where the circuit is effectively grounded and the neutral conductor meets Rule 230E1, phase-to-neutral voltage shall be used to determine the clearance from the surface of support arms and structures.

⑪These clearances may be reduced by not more than 25% to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than 25% provided that full clearance is maintained to the uninsulated portion of the guy.

⑫Phase-to-phase voltages shall be determined according to Rule 235A3.

⑬These clearances apply to communication antennas operated at a radio frequency of 3 kHz to 300 GHz. Also see Rules 235I4 and 239.

⑭Does not include neutral conductors meeting Rule 230E1.

in

Table 235-6—
Clearance in any direction from line conductors to supports and to vertical or lateral conductors, span, or guy wires attached to the same support
[See also Rules 235E1, 235E3b(2), and 235I.]

Clearance of line conductors from	Communication lines in general (in)	Communication lines on jointly used structures; neutral conductors meeting Rule 230E1 (in)	Supply lines Circuit phase-to-phase voltage		
			0 to 8.7 kV ⑭ (in)	Over 8.7 to 50 kV (in)	Over 50 to 814 kV ④ ⑨ (in)
1. Vertical and lateral conductors:					
a. Of the same circuit	3	3	3	3 plus 0.25 per kV in excess of 8.7 kV	No value specified
b. Of other circuits ⑫ ⑬	3	3	6 ⑤	6 plus 0.4 per kV in excess of 8.7 kV	23 plus 0.4 per kV in excess of 50 kV
2. Span or guy wires,⑪ or messengers attached to same structure:					
a. When parallel to line	3 ⑦	6 ① ⑦	12 ①	12 plus 0.4 per kV in excess of 8.7 kV	29 plus 0.4 per kV in excess of 50 kV
b. Anchor guys	3 ⑦	6 ① ⑦	6 ⑦	6 plus 0.25 per kV in excess of 8.7 kV	16 plus 0.25 per kV in excess of 50 kV
c. All other	3 ⑦	6 ① ⑦	6	6 plus 0.4 per kV in excess of 8.7 kV	23 plus 0.4 per kV in excess of 50 kV
3. Surface of support arms	3 ② ⑥	3 ② ⑥	3 ⑧	3 plus 0.2 per kV in excess of 8.7 kV ⑧⑩	11 plus 0.2 per kV in excess of 50 kV

Table 235-8—Vertical spacing between conductors supported on vertical racks or separate brackets

Span length		Vertical spacing between conductors	
(m)	(ft)	(mm)	(in)
0 to 45	0 to 150	100	4
Over 45 to 60	Over 150 to 200	150	6
Over 60 to 75	Over 200 to 250	200	8
Over 75 to 90	Over 250 to 300	300	12

EXCEPTION: The vertical spacing between open wire conductors may be reduced where the conductors are held apart by intermediate spacers, but may not be less than 100 mm (4 in).

236. Climbing space

The following requirements apply only to portions of structures that workers ascend.

A. Location and dimensions

1. A climbing space having the horizontal dimensions specified in Rule 236E shall be provided past any conductors, support arms, or other parts.
2. The climbing space need be provided on one side or corner of the support only.
3. The climbing space shall extend vertically past any conductor or other part between levels above and below the conductor as specified in Rules 236E, F, G, and I, but may otherwise be shifted from any side or corner of the support to any other side or corner.

B. Portions of supporting structures in climbing space

Portions of the supporting structure, when included in one side or corner of the climbing space, are not considered to obstruct the climbing space.

C. Support arm location relative to climbing space

RECOMMENDATION: Support arms should be located on the same side of the pole.

EXCEPTION: This recommendation does not apply where double crossarms are used on any pole or where crossarms on any pole are not all parallel.

D. Location of equipment relative to climbing space

1. All supply and communication equipment such as transformers, regulators, capacitors, cable terminals (potheads), amplifiers, loading coils, antennas, surge arresters, switches, etc., when located below conductors or other attachments, shall be mounted outside of the climbing space.
2. All exposed ungrounded conductive parts of luminaires and their supports that are not insulated from current-carrying parts shall be maintained at not less than 500 mm (20 in) from the surface of their supporting structure.

EXCEPTION 1: This may be reduced to 125 mm (5 in) if located on the side of the structure opposite the designated climbing space.

EXCEPTION 2: This does not apply where the equipment is located at the top or other vertical portion of the structure that is not subject to climbing.

E. Climbing space between conductors

Climbing space between conductors shall be not less than the horizontal dimensions specified in Table 236-1. These dimensions are intended to provide a clear climbing space of 600 mm (24 in) while the conductors bounding the climbing space are covered with temporarily installed protective covering rated for the voltage involved. The climbing space shall be provided both along and across the line and shall be projected vertically not less than 1.0 m (40 in) above and below the limiting conductors. Where communication conductors are above supply conductors of more than 8.7 kV to ground or 15 kV line to line, the climbing space shall be projected vertically at least 1.50 m (60 in) above the highest supply conductors.

EXCEPTION 1: This rule does not apply if it is the unvarying practice of the employers concerned to prohibit employees from ascending beyond the conductors or equipment of a given line or structure unless the conductors or equipment are de-energized and grounded per Rule 444D.

EXCEPTION 2: For supply conductors carried on a structure in a position below communications facilities in the manner permitted in Rule 220B2, the climbing space need not extend more than 600 mm (2 ft) above such supply space.

EXCEPTION 3: If the conductors are owned, operated, or maintained by the same utility, the climbing space may be provided by temporarily moving the line conductors using live-line tools.

F. Climbing space on buckarm construction

Method of providing climbing space on buckarm construction

The full width of climbing space shall be maintained on buckarm construction and shall extend vertically in the same position at least 1.0 m (40 in) [or 1.50 m (60 in) where required by Rule 236E] above and below any limiting conductor.

A six-pin crossarm having pin spacing of 370 mm (14.5 in) may be used to provide a 750 mm (30 in) climbing space on one corner of a junction pole by omitting the pole pins on all arms, and inserting pins midway between the remaining pins so as to give a spacing of 185 mm (7.25 in), provided that all of the following conditions are met:

1. Circuits are less than 8.7 kV to ground or 15 kV line to line
2. Span lengths do not exceed 45 m (150 ft)
3. Sags do not exceed 380 mm (15 in) for wires of AWG No. 2 and larger sizes, or 750 mm (30 in) for wires smaller than AWG No. 2
4. Each conductor on the end of every arm is tied to the same side of its insulator
5. The spacing on the next pole is not less than 370 mm (14.5 in)

G. Climbing space past longitudinal runs not on support arms

The full width of climbing space shall be provided past longitudinal runs and shall extend vertically in the same position from 1.0 m (40 in) below the run to a point 1.0 m (40 in) above [or 1.50 m (60 in) where required by Rule 236E]. The width of climbing space shall be measured from the longitudinal run concerned. Longitudinal runs on racks, or cables on messengers, are not considered as obstructing the climbing space if the location, size, and quantity of the cables permit qualified workers to climb past them. This does not apply where communication conductors are above the longitudinal runs concerned.

EXCEPTION 1: If a supply longitudinal run is placed on the side or corner of the supporting structure where climbing space is provided, the width of climbing space shall be measured horizontally from the center of the structure to the nearest supply conductors on support arms, under both of the following conditions:

(a) Where the longitudinal run consists of neutral conductors meeting Rule 230E1, open supply conductors carrying not more than 750 V, or supply cables and conductors meeting Rule 230C, all voltages; and is supported close to the structure as by brackets, racks, or pins close to the structure

(b) Where the nearest supply conductors on support arms are parallel to and on the same side of the structure as the longitudinal run and within 1.20 m (4 ft) above or below the run

EXCEPTION 2: For supply conductors carried on a structure in a position below communications facilities in the manner permitted in Rule 220B2, the climbing space need not extend more than 600 mm (2 ft) above such supply space.

EXCEPTION 3: A service drop less than 750 V and meeting Rule 230C is not considered to obstruct the climbing space if all conductors concerned are covered by rubber protective equipment or otherwise guarded as an unvarying practice before workers climb past them, provided that such a service drop is (1) not closer to the longitudinal run at the point of attachment than the diameter of the pole plus 125 mm (5 in) measured horizontally, and (2) not closer than 950 mm (38 in) measured horizontally to the longitudinal run at a point 750 mm (30 in) on the run measured from the point of attachment at the pole. See Figure 236-1.

H. Climbing space past vertical conductors

Vertical runs physically protected by suitable conduit or other protective covering and securely attached without spacers to the surface of the line structure are not considered to obstruct the climbing space.

I. Climbing space near ridge-pin conductors

The climbing space specified in Table 236-1 shall be provided above the top support arm to the ridge-pin conductor but need not be carried past it.

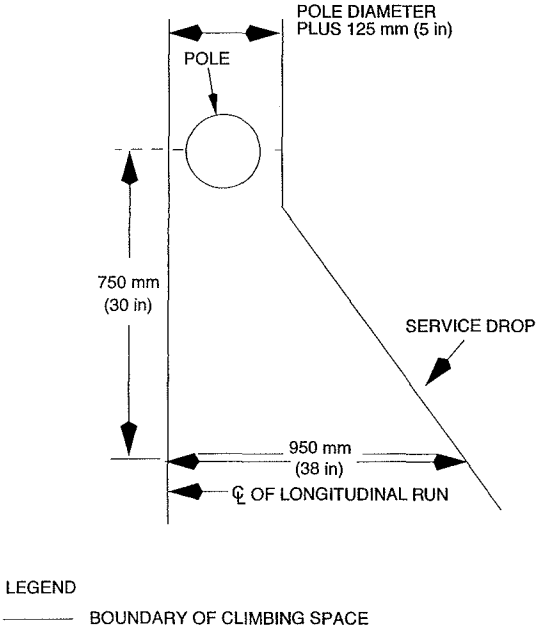


Figure 236-1—Rule 236G, *Exception 3*

Table 236-1— Horizontal clearance between conductors bounding the climbing space

(All voltages are between the two conductors bounding the climbing space except for communication conductors, which are voltage to ground. Where the two conductors are in different circuits, the voltage between conductors shall be the arithmetic sum of the voltages of each conductor to ground for a grounded circuit, or phase to phase for an ungrounded conductor. See also Rule 236E.)

Character of conductors adjacent to climbing space	Voltage of conductors	Horizontal clearance between conductors bounding the climbing space ③							
		On structures used solely by				On jointly used structures			
		Communication conductors		Supply conductors		Supply conductors above communication conductors		Communication conductors above supply conductors①	
		(m)	(in)	(m)	(in)	(m)	(in)	(m)	(in)
1. Communication conductors	0 to 150 V	0.60	No requirements		—		②	0.60	No requirements
	Exceeding 150 V		24 recommended		—		②		24 recommended
2. Supply cables meeting Rule 230C1	All voltages				—		②		No requirements
3. Supply cables meeting Rule 230C2 or 3	All voltages	—	—	0.60	24	0.60	24	0.75	30
4. Open supply line conductors and supply cables meeting Rule 230D	0 to 750 V	—	—	0.60	24	0.60	24	0.75	30
	750 V to 15 kV	—	—	0.75	30	0.75	30	0.75	30
	15 kV to 28 kV	—	—	0.90	36	0.90	36	0.90	36
	28 kV to 38 kV	—	—	1.00	40	1.00	40		
	38 kV to 50 kV	—	—	1.17	46	1.17	46		
	50 kV to 73 kV	—	—	1.40	54	1.40	54		
	Exceeding 73 kV	—	—	>1.40	>54				

①This relation of levels in general is not desirable and should be avoided.

②Climbing space shall be the same as required for the supply conductors immediately above, with a maximum of 0.75 m (30 in) except that a climbing space of 0.41 m (16 in) across the line may be employed for communication cables or conductors where the only supply conductors at a higher level are secondaries (0 to 750 V) supplying airport or airway marker lights or crossing over the communication line and attached to the pole top or to a pole-top extension fixture.

③Attention is called to the operating requirements of Rules 441A and 446C, Part 4, of this Code.

237. Working space

A. Location of working spaces

Working spaces shall be provided on the climbing face of the structure at each side of the climbing space.

B. Dimensions of working spaces

1. Along the support arm

The working space shall extend from the climbing space to the outmost conductor position on the support arm.

2. At right angles to the support arm

The working space shall have the same dimension as the climbing space (see Rule 236E). This dimension shall be measured horizontally from the face of the support arm.

3. Vertically

The working space shall have a height not less than that required by Rule 235 for the vertical separation of line conductors carried at different levels on the same support.

C. Location of vertical and lateral conductors relative to working spaces

The working spaces shall not be obstructed by vertical or lateral conductors. Such conductors shall be located on the opposite side of the pole from the climbing side or on the climbing side of the pole at a distance from the support arm at least as great as the width of climbing space required for the highest voltage conductors concerned. Vertical conductors enclosed in suitable conduit may be attached on the climbing side of the structure.

D. Location of buckarms relative to working spaces

Buckarms may be used under any of the following conditions, provided the climbing space is maintained. Climbing space may be obtained as in Rule 236F.

1. Standard height of working space

Lateral working space of the height required by Table 235-5 shall be provided between the crossing or tap line conductors attached to the buckarm and the main line conductors. This may be accomplished by increasing the spacing between the line support arms, as shown in Figure 237-1.

2. Reduced height of working space

Where no circuits exceeding 8.7 kV to ground or 15 kV line to line are involved and the clearances of Rules 235B1a and 235B1b are maintained, conductors supported on buckarms may be placed between line conductors having normal vertical spacing, even though such buckarms obstruct the normal working space, provided that a working space of not less than 450 mm (18 in) in height is maintained either above or below line conductors and buckarm conductors.

EXCEPTION: The above working space may be reduced to 300 mm (12 in) if both of the following conditions exist:

(a) Not more than two sets of the line arms and buckarms are involved

(b) Working conditions are rendered safe by providing rubber protective equipment or other suitable devices to insulate and cover line conductors and equipment that are not being worked upon

E. Guarding of energized equipment

Exposed energized parts of equipment such as switches, circuit breakers, surge arresters, etc., shall be enclosed or guarded if all of the following conditions apply:

1. The equipment is located below the top conductor support
2. The equipment is located on the climbing side of the structure
3. The requirements of Rule 441, Part 4, of this Code cannot be met

F. Working clearances from energized equipment

All parts of equipment such as switches, fuses, transformers, surge arresters, luminaires and their support brackets, etc., or other connections that may require operation or adjustment while energized and exposed at such times, shall be so arranged with respect to each other, other equipment, vertical and lateral conductors, and portions of the supporting structure, including supporting platforms or structural members, that in adjustment or operation no portion of the body, including the hands, need be brought closer to any exposed energized parts or conductors than permitted in Part 4, Rule 441 or 446 of this Code.

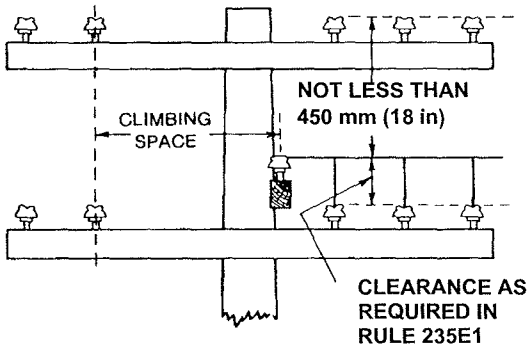


Figure 237-1—Obstruction of working space by buckarm

238. Vertical clearance between certain communications and supply facilities located on the same structure

A. Equipment

For the purpose of measuring clearances under this rule, equipment shall be taken to mean non-current-carrying metal parts of equipment, including metal supports for cables or conductors, and metal support braces that are attached to metal supports or are less than 25 mm (1 in) from transformer cases or hangers that are not effectively grounded.

B. Clearances in general

Vertical clearances between supply conductors and communications equipment, between communication conductors and supply equipment, and between supply and communications equipment shall be as specified in Table 238-1, except as provided in Rule 238C.

C. Clearances for span wires or brackets

Span wires or brackets carrying luminaires, traffic signals, or trolley conductors shall have at least the vertical clearances in millimeters or inches from communications equipment set forth in Table 238-2.

D. Clearance of drip loops of luminaire or traffic signal brackets

If a drip loop of conductors entering a luminaire bracket or traffic signal bracket from the surface of the structure is above a communication cable, the lowest point of the loop shall be at least 300 mm (12 in) above communication cable or through bolt.

EXCEPTION: The above clearance may be reduced to 75 mm (3 in) if the loop is covered by a suitable nonmetallic covering that extends at least 50 mm (2 in) beyond the loop.

E. Communication worker safety zone

The clearances specified in Rules 235C and 238 create a communication worker safety zone between the facilities located in the supply space and facilities located in the communication space, both at the structure and in the span between structures. Except as allowed by Rules 238C, 238D, and 239, no supply or communication facility shall be located in the communication worker safety zone.

Table 238-1—Vertical clearance between supply conductors and communications equipment, between communication conductors and supply equipment, and between supply and communications equipment

(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definitions section for voltages of other systems. See also Rule 238B.)

Supply voltage (kV)	Vertical clearance	
	(m)	(in)
1. Grounded conductor and messenger hardware and supports	0.75	30
2. 0 to 8.7	1.00	40 ①
3. Over 8.7	1.00 plus 0.01 per kV in excess of 8.7 kV	40 plus 0.4 per kV ① in excess of 8.7 kV

①Where non-current-carrying parts of supply equipment are effectively grounded and the associated neutral meeting Rule 230E1 or supply cables meeting Rule 230C1 (including the support brackets) are bonded to communication messengers at intervals meeting Rule 92C through out well-defined areas and where communication is at lower levels, clearances may be reduced to 0.75 m (30 in).

Table 238-2—Vertical clearance of span wires and brackets from communication lines

(See also Rule 238C.)

	Carrying luminaires or traffic signals				Carrying trolley conductors			
	Not effectively grounded		Effectively grounded		Not effectively grounded		Effectively grounded	
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
Above communication support arms	500	20 ①	500	20 ①	500	20 ①	500	20 ①
Below communication support arms	1000	40 ③	600	24	600	24	600	24
Above messengers carrying communication cables	500	20 ①	100	4	300	12	100	4
Below messengers carrying communication cables	1000	40 ④	100	4	300	12	100	4
From terminal box of communication cable	500	20 ①	100	4	300	12 ②	100	4
From communication brackets, bridle wire rings, or drive hooks	410	16 ①	100	4	100	4	100	4

①This may be reduced to 300 mm (12 in) for either span wires or metal parts of brackets at points 1.0 m (40 in) or more from the structure surface.

②Where it is not practical to obtain a clearance of 300 mm (1 ft) from terminal boxes of communication cables, all metal parts of terminals shall have the greatest possible clearance from fixtures or span wires including all supporting screws and bolts of both attachments.

③This may be reduced to 600 mm (24 in) for luminaires and traffic signals operating at less than 150 V to ground.

④This may be reduced to 500 mm (20 in) for luminaires and traffic signals operating at less than 150 V to ground.

239. Clearance of vertical and lateral facilities from other facilities and surfaces on the same supporting structure

Vertical and lateral conductors shall have the clearances required by this rule from other facilities or surfaces on the same supporting structure.

A. General

1. Grounding conductors, surge-protection wires, neutral conductors meeting Rule 230E1, insulated communication conductors and cables, supply cables meeting Rule 230C1 or 350B, insulated supply cables of 0 to 750 V, or conduits may be placed directly on the supporting structure. These conductors, wires, cables, and conduits shall be securely attached to the surface of the structure. Cables not in conduit shall be installed in such a manner as to avoid abrasion at the point of attachment.

2. Installation of supply cable and communication cable in same duct or U-guard type covering

   a. Supply cables 0 to 600 V may be installed together in the same duct or U-guard, if all of the cables are operated and maintained by the same utility.

   b. Supply cables exceeding 600 V meeting Rule 230C1 may be installed together in the same duct or U-guard if all of the cables are operated and maintained by the same utility.

   c. Supply cables 0 to 600 V and supply cables exceeding 600 V meeting Rule 230C1 may be installed together in the same duct or U-guard if all of the cables are operated and maintained by the same utility.

   d. Supply cables shall not be installed in the same duct or U-guard with communication cables unless all of the cables are operated and maintained by the same utility.

   e. Communication cables may be installed together in the same duct or U-guard provided all utilities involved are in agreement.

3. Paired communication conductors in rings may be attached directly to a structure or messenger.

4. Insulated supply circuits of 600 V or less and not exceeding 5000 W may be placed in the same cable with control circuits with which they are associated.

5. The term nonmetallic covering as used in Rule 239 refers to material other than a cable jacket that provides an additional barrier against physical contact.

6. Where guarding and protection are required by other rules, either conduit or U-guards may be used.

B. Location of vertical or lateral conductors relative to climbing spaces, working spaces, and pole steps

Vertical or lateral conductors shall be located so that they do not obstruct climbing spaces, or lateral working spaces between line conductors at different levels, or interfere with the safe use of pole steps.

EXCEPTION: This rule does not apply to portions of the structure that workers do not ascend while the conductors in question are energized.

NOTE: See Rule 236H for vertical runs in conduit or other protective covering.

C. Conductors not in conduit

Conductors not encased in conduit shall have the same clearances from conduits as from other surfaces of structures.

EXCEPTION: Vertical runs of effectively grounded supply conductors may have a clearance of 25 mm (1 in).

H. Requirements for vertical communication conductors passing through supply space on jointly used structures

All vertical runs of communication conductors passing through supply space shall be installed as follows:

1. Metal-sheathed communication cables

Vertical runs of metal-sheathed communication cables shall be covered with suitable nonmetallic material, where they pass trolley feeders or other supply line conductors. This nonmetallic covering shall extend from a point 1.0 m (40 in) above the highest trolley feeders or other supply conductors, to a point 1.80 m (6 ft) below the lowest trolley feeders or other supply conductors, but need not extend below the top of any mechanical protection that may be provided near the ground.

EXCEPTION 1: Communication cables may be run vertically on the pole through space occupied by railroad signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

2. Communication conductors

Vertical runs of insulated communication conductors shall be covered with suitable nonmetallic material, to the extent required for metal-sheathed communication cables in Rule 239H1, where such conductors pass trolley feeders or supply conductors.

EXCEPTION 1: Communication conductors may be run vertically on the structure through space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

3. Communication grounding conductors

Vertical communication grounding conductors shall be covered with suitable nonmetallic material between points at least 1.80 m (6 ft) below and 1.0 m (40 in) above any trolley feeders or other supply line conductors by which they pass.

EXCEPTION 1: Communication grounding conductors may be run vertically on the structure though space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

4. Clearance from through bolts and other metal objects

Vertical runs of communication conductors or cables shall have a clearance of one-eighth of the pole circumference but not less than 50 mm (2 in) from exposed through bolts and other exposed metal objects attached thereto that are associated with supply line equipment.

EXCEPTION: Vertical runs of effectively grounded communication cables may have a clearance of 25 mm (1 in).

I. Operating rods

Effectively grounded or insulated operating rods of switches are permitted to pass through the communication space, but shall be located outside of the climbing space.

J. Additional rules for standoff brackets

1. Standoff brackets may be used to support the conduit(s). Cable insulation appropriate for the intended service is required; non-metallic conduit shall not be used to meet basic insulation requirements.

NOTE: See Rule 217A2.

Attachment 3
Declaration of David Marne

Submitted to the New York PSC with NextG's comments in *Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles*, NY PSC Case No. Case 07-M-0741 (filed Sept. 10, 2007);

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE 07-M-0741 –	Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles

DECLARATION OF DAVID MARNE

I, David Marne, do hereby state:

1. I am the company president and senior electrical engineer for Marne and Associates, Inc. in Missoula, Montana, where I specialize in National Electrical Safety Code ("NESC") training and engineering design. I am a registered Professional Engineer and I consult with both the electric and communication utilities on joint use pole attachment engineering issues, including with NextG.

2. I hold a bachelors of science degree in electrical engineering from Montana State University. Currently, I serve on NESC Subcommittee 4, which addresses overhead lines-clearances issues. I am a senior member of the Institute of Electrical and Electronic Engineers, Inc. ("IEEE"). The IEEE is the publisher of the NESC. I am also the author of "McGraw-Hill's National Electrical Safety Code 2007 Handbook," and frequently present seminars on the NESC to a variety of electric power and communication utility professionals. My associate at Marne and Associates, Grant Glaus, is also a registered professional engineer and is on NESC Subcommittee 5, which addresses overhead lines-strength and loading issues.

3. Prior to founding Marne and Associations, I worked as a consulting electrical engineer for 22 years. I have been involved in NESC training for over 10 years.

4. In my role as a consultant to NextG, my company provides consulting on an as requested basis helping NextG assure compliance with the NESC. In that capacity, my company has performed a "typical" pole attachment loading calculation dated Mar. 21, 2007, attached hereto as Exhibit A. A summary of the calculations, which is shown below, indicates that pole line conductors (power and communication) put substantially more load on a pole than vertical antenna and pole top extension structures. Independent of the values, all loads on the structure must be considered when designing a pole line.

Mwp	**3,682** ft-lb moment due to wind on pole
(Sh)(Mwc)	**53,352** ft-lb moment due to wind on conductor (for a 275' span length)
Mwt	**1,449** ft-lb moment due to wind on transformer
Mwa	**777** ft-lb moment due to wind on antenna
Mwpe	**632** ft-lb moment due to wind on pole extension
Mwe	**560** ft-lb moment due to wind on communication equipment box

5. The National Electrical Safety Code ("NESC") addresses communication antennas on the top of power poles and refers to these installations as communication antennas in the supply (power) space. The rules in the NESC, including the rules related to communication antenna installations, are for the safety of electric power and communication workers and the public.

I declare under penalty of perjury that the statements contained in this Declaration are true and correct.

David Marne

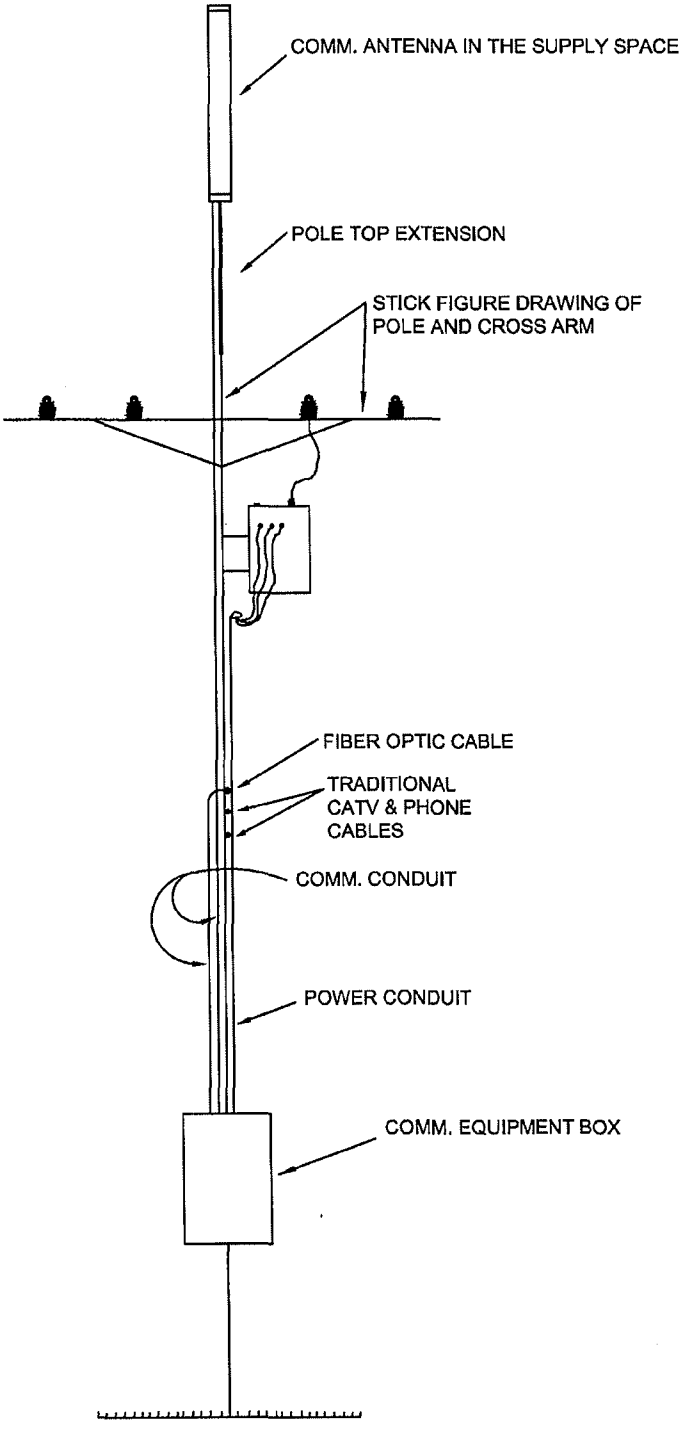
David Marne

Dated September 7, 2007

Exhibit A

POLE LOADING ASSUMPTIONS:

1. 45' CLASS 4 WOOD POLE BURIED 6.5' DEEP.
2. 336 ACSR CONDUCTOR WITH FULL NEUTRAL POSITIONED ON THE CROSS ARM.
3. 275' SPAN ON EACH SIDE OF THE POLE.
4. 57" HIGH, 6.25" DIAMETER ANTENNA WEIGHING 20 LBS.
5. 1-15 KVA TRANSFORMER ON THE POLE.
6. 1-288 COUNT FIBER OPTIC CABLE LASHED TO A 1/4" EHS MESSENGER (275' SPAN).
7. 1-.750 COAX CABLE TV CABLE LASHED TO A 5/16" EHS MESSENGER. (275' SPAN)
8. 1-200 PAIR TELEPHONE CABLE LASHED TO A 5/16" EHS MESSENGER. (275' SPAN)
9. TANGENT POLE (NO LINE ANGLE).
10. COMM. EQUIPMENT BOX SIZE: 48"H X 24"W X 12" D. WEIGHT: 250 LBS. LOCATION: CENTERED 10' ABOVE GROUND.
11. ASSUME EXISTING POLE (PRIOR TO ANTENNA MOUNTING) WAS FRAMED USING RUS "C1" POLE TOP FRAMING.
12. ASSUME THE SAME POLE WAS MODIFIED TO RUS "C9-1" POLE TOP FRAMING AND A 48" POLE TOP EXTENSION WAS ADDED TO THE POLE.
13. ASSUME NESC CLEARANCE ISSUES HAVE BEEN ADDRESSED AND MET (NESC RULES 232, 235C, 235I, 238, 239H, ETC.).
14. ASSUME NESC WORK RULES HAVE BEEN ADDRESSED AND MET (NESC RULES 420Q, ETC.).
15. ASSUME NESC GROUNDING RULES HAVE BEEN ADDRESSED AND MET (NESC SECTION 09).
16. ASSUME POLE TOP EXTENSION, ANTENNA, AND COMM. EQUIPMENT BOX MOUNTING HARDWARE ARE OF ADEQUATE STRENGTH.
17. ASSUME NESC GRADE "C" LOAD AND STRENGTH FACTORS, ASSUME NESC "MEDIUM" LOADING ZONE.
18. ASSUMPTIONS MUST BE MODIFIED TO REFLECT ACTUAL CONDITIONS WHEN CALCULATING ACTUAL INSTALLATIONS.



"TYPICAL" 45' POLE WITH ANTENNA MOUNTED ON POLE TOP
(Not to Scale)

Marne and Associates, Inc. Experts in Electrical Code	Eng/Dwn: DJM/CCM Scale: NOT TO SCALE Date: 3-21-07 Plot: 3-21-07 Proj. No: MA-0015	NEXTG NETWORKS POLE TOP ANTENNA REVIEW	File Name: ANTENNA REVIEW PG1.dwg Sheet 1 of 4 Drawing 1

45-4 Wood Pole with antenna

Load calculations per RUS Distribution Design Guides (Bulletins 1724E-150 through 154)
RUS "C9" Pole-top framing (all four wires on crossarm)
Antenna added on a four-foot pole extension with same diamter as top of pole
NESC Medium Loading District, Grade C

(a) Total ground line moment, including NESC load factors

(1) Pole circumference at ground line

$$C_g = \frac{(L_p - L_g)(C_b - C_t)}{L_p - L_b} + C_t$$

Cg	**38.28** in	pole circumference at ground line
Lp	45.0 ft	length of pole
Lg	6.5 ft	distance from pole bottom to groundline
Lb	6.0 ft	distance from pole bottom to classification point (6 ft per ANSI O5.1)
Cb	38.50 in	pole circumference at classification point (Lb)
Ct	21.00 in	pole circumference at pole top

(2) Moment due to wind on pole

$$M_{wp} = F_{OW} W_p \left(\frac{2C_t + C_g}{72\pi} \right) H_p^2$$

Mwp	**3682** ft-lb	moment due to wind on pole
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Wp	4.00 lb/ft^2	wind pressure
Ct	21.00 in	pole circumference at pole top
Cg	38.28 in	pole circumference at ground line
Hp	38.5 ft	height of pole top above groundline

(3) Moment due to wind on conductors (per unit length)

$$M_{wc} = F_{ow} \left(\sum W_h H_c \right)$$

(Sh)(Mwc)	**53351.54** ft-lb	moment due to wind on conductor (for a 275' span length)
Mwc	**194.01** ft-lb/ft	moment due to wind on conductor (per unit length)
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Whp	0.3947 lb/ft	horizontal wind force on phase conductor
Hcp	37.75 ft	height of phase conductor
Whp	0.3947 lb/ft	horizontal wind force on phase conductor
Hcp	37.75 ft	height of phase conductor
Whp	0.3947 lb/ft	horizontal wind force on phase conductor
Hcp	37.75 ft	height of phase conductor
Whn	0.3947 lb/ft	horizontal wind force on neutral conductor
Hcn	37.75 ft	height of neutral conductor
Wht	0.536 lb/ft	horizontal wind force on fiber-optic cables
Hct	29.67 ft	height of cable fiber-optic cables
Wht	0.521 lb/ft	horizontal wind force on cable TV cables
Hct	28.67 ft	height of cable TV cables
Whc	0.738 lb/ft	horizontal wind force on telphone cables
Hcc	27.67 ft	height of telephone cables

(4) Moment due to wind on transformer

$$M_{wt} = F_{ow} W_p A H$$

Mwt	**1449.0** ft-lb	moment due to wind on transformer
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Wp	4.00 lb/ft^2	wind pressure
A	6 ft^2	cross sectional area
H	34.5 ft	mounting height (center of area)

(5) Moment due to wind on antenna

$$M_{wa} = F_{ow} W_p A H$$

Mwa	**777.1** ft-lb	moment due to wind on antenna
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Wp	4.00 lb/ft^2	wind pressure
A	2.474 ft^2	cross sectional area
H	44.875 ft	mounting height (center of area)

(6) Moment due to wind on pole extension

$$M_{wpe} = F_{ow} W_p A H$$

Mwpe	**632.2** ft-lb	moment due to wind on pole extension
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Wp	4.00 lb/ft^2	wind pressure
A	2.23 ft^2	cross sectional area
H	40.5 ft	mounting height (center of area)

(7) Moment due to wind on communication equipment box

$$M_{we} = F_{ow} W_p A H$$

Mwe	**560.0** ft-lb	moment due to wind on communication equipment box
Fow	1.75	NESC load factor for wind loads (Grade C, not at crossing)
Wp	4.00 lb/ft^2	wind pressure
A	8 ft^2	cross sectional area
H	10 ft	mounting height (center of area)

(8) Total ground line moment, including NESC load factors

$$M_g = 1.05\left(M_{wp} + S_h M_{wc} + M_{wt} + M_{wa} + M_{wpe} + M_{we}\right)$$

Mg	**63,475** ft-lb	total ground line moment, including NESC load factors
Sh	275 ft-lb	wind span

(b) Allowable resisting moment of pole, including NESC strength factors

(1) Permitted moment at ground line

$$M_r = F_s K_r F_b C_g^3$$

Mr	**75,499**	ft-lb	permitted moment at ground line, including NESC strength factors
Fs	0.85		NESC strength factor
Kr	2.64E-04	ft/in	calculation constant (2.64×10^{-4} ft/in)
Fb	6000	lb/in^2	designated fiber stress
Cg	38.28	in	pole circumference at ground line

(c) Strength requirement of pole

(1) Must be able to withstand expected loads, including load and strength factors

$$M_g \leq M_r$$

Mg ≤ Mr	**yes**		is the pole strength sufficient to withstand the loads?
Mg	63,475	ft-lb	total ground line moment, including NESC load factors
Mr	75,499	ft-lb	permitted moment at ground line, including NESC strength factors

(d) Pole loading summary

	Mwp	**3,682**	ft-lb	moment due to wind on pole
	(Sh)(Mwc)	**53,352**	ft-lb	moment due to wind on conductor (for a 275' span length)
	Mwt	**1,449**	ft-lb	moment due to wind on transformer
	Mwa	**777**	ft-lb	moment due to wind on antenna
	Mwpe	**632**	ft-lb	moment due to wind on pole extension
	Mwe	**560**	ft-lb	moment due to wind on communication equipment box
	Subtotal	**60,452**	ft-lb	
Total	Mg	**63,475**	ft-lb	total ground line moment, including NESC load factors and RUS 1.05 equipment factor

Attachment 4
Declaration of David Marne
Submitted to the FCC by NextG in the complaint proceeding
NextG Networks of NY, Inc. v. Public Service Electric & Gas
File No. EB-07-MD-004 (filed Feb. 11, 2008)

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

NEXTG NETWORKS OF NY, INC. *Complainant,* v. PUBLIC SERVICE ELECTRIC & GAS COMPANY, *Respondent.*	File No. EB-07-MD-004

REPLY DECLARATION OF DAVID J. MARNE, P.E.

I, David J. Marne, P.E., do hereby state:

1. I am a licensed Professional Engineer and President of Marne and Associates, Inc., an engineering consulting firm. I am a member of National Electrical Safety Code® (NESC®) Subcommittee 4, Overhead Lines-Clearances and I am the author of McGraw-Hill's National Electrical Safety Code® (NESC®) 2007 Handbook. Attached is my Curriculum Vitae (Attachment C).

2. I am executing this Declaration in support of NextG's Reply to the Response of PSE&G in the above-captioned case.

3. Mr. Anthony Ramirez, in his Declaration supporting PSE&G's Response, appears to indicate that safety and reliability concerns should prohibit NextG from mounting communications antennas on PSE&G's poles. The intent of this document is to address statements in Mr. Ramirez's Response. PSE&G appears to be citing National Electrical Safety Code® (NESC®) rules to prohibit the attachment of NextG's communication antenna while in

fact the NESC contains several rules recognizing and providing methods for the safe installation of a communications antenna in the supply space on a pole top. Attached is a point by point review of Mr. Ramirez's Declaration (Attachment A) which I incorporate into my declaration. Also attached are NESC Rules 235I, 239H, and 420Q (Attachment B).

4. It is my opinion that the safety, reliability, and other concerns outlined by Mr. Ramirez on behalf of PSE&G can be resolved or negated using the National Electrical Safety Code (NESC) rules and industry practice.

I declare under penalty of perjury that the information and statements contained in this Declaration are true and correct.

David J. Marne, P.E.

February 11, 2008
Date

Attachment A

REPLY DECLARATION OF DAVID J. MARNE, P.E.

Marne and Associates, Inc.
Experts in Electrical Code

February 11, 2008

REPLY DECLARATION OF DAVID J. MARNE, P.E.

Comments on "Affidavit of Anthony Ramirez in Support of Response" (Exhibit AR-1 and Exhibit AR-2)

Introduction

The intent of this document is to address statements in the, "Affidavit of Anthony Ramirez in Support of Response" (Exhibit AR-1 and Exhibit AR-2)." PSE&G appears to be citing National Electrical Safety Code® (NESC®) rules to prohibit the attachment of NextG's communication antenna while in fact the NESC contains several rules recognizing and providing methods for the safe installation of a communications antenna in the supply space on a pole top. More specifically, the following NESC rules address the installation of a communication antenna in the supply space.

NESC Rule 235I titled, Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

NESC Rule 239H titled, Requirements for vertical communication conductors passing through supply space on jointly used structures

NESC Rule 420Q titled, Communication antennas

Installation of a communications antenna on a power pole does take cooperation between the parties involved but the basic provisions for safety are addressed in the NESC.

Comments on "Safety Issues Relating to Pole Top Antennas"

1st Bullet:
Grounded equipment in proximity to energized power facilities is commonplace in the electric utility industry. A grounded transformer case, a grounded lightning arrestor, a grounded static wire, and even a grounded steel pole are common examples of grounded equipment in close proximity to energized power facilities. The same skill and care used around this equipment would be used by PSE&G crews around NextG's antenna and associated equipment. The statement that PSE&G is "one of few" utilities

in the country that performs maintenance and repairs on live (electrically energized) conductors and facilities by "gloving" is an exaggeration. Rubber gloving is used by electric utilities around the country. Power linemen are trained in rubber glove work and rubber glove techniques are covered in OSHA Standard 1910.269 and Part 4 of the National Electrical Safety Code.

2nd Bullet:
The NESC rule cited by PSE&G (NESC Rule 446) appears to apply to live-line bare-hand work and does not contain cover-up wording that the applicable OSHA standard (OSHA 1910.269) contains. The OSHA standard applicable to this work is shown below:

> **1910.269(q)(3)(xiii)**
>
> The minimum approach distances specified in Table R-6 through Table R-10 shall be maintained from all grounded objects and from lines and equipment at a potential different from that to which the live-line bare-hand equipment is bonded, unless such grounded objects and other lines and equipment are covered by insulating guards.

Independent of the application of the rule, NextG's antenna will be located a minimum of 40 inches away for the energized line and NextG's communication riser feeding the antenna will be covered with suitable nonmetallic material. The 40 inch requirement and the nonmetallic covering requirement are specified in NESC Rule 239H.

3rd Bullet:
NextG's antenna will be grounded bonded to PSE&G's ground (not separately grounded). The safe installation practice for the connection between the pole top antenna and the communications equipment near the base of the pole is covered in NESC Rule 239H.

4th Bullet:
The safe installation practices related to wind forces on equipment and weights of equipment are covered in NESC Sections 24, 25, and 26. The NESC rules in these sections are applicable to electric power lines and equipment as well as communications lines and equipment. It is possible for the pole top conductor on a power pole (energized phase or grounded static) to have more weight and a larger wind surface area (when considering the wind span length and weight span length) than a pole top antenna.

5th Bullet:
The safe installation practices related to wind forces on equipment and weights of equipment are covered in NESC Sections 24, 25, and 26. The NESC rules in these sections protect the general public from falling energized lines and equipment and from

falling communication lines and equipment. The grade of construction in the NESC is higher for energized lines and equipment (typically Grade C) compared to communication lines and equipment (typically Grade N) due to the higher danger that energized lines impose. However, when communications lines are attached to power poles the NESC requires that the communication lines be attached using the same grade of construction as the energized lines.

6th Bullet:
NESC Rule 420Q addresses worker exposure to radio frequencies. It is my understanding that NextG has hired a radio frequency (RF) expert to determine exposure levels and compare the levels to applicable regulatory standards.

Comments on "Reliability Issues With Pole Top Antennas"

1st Bullet:
No comment.

2nd Bullet:
As discussed above, the installation of a pole top antenna can be accomplished with the continued use of rubber gloving techniques.

3rd Bullet:
I do not have any comments on lightning strike data (number of times per year or percentages). Some electric utilities mount a static or neutral at the top position on their poles. This is very common with transmission lines but only common on distribution lines in very high lightning areas. Assuming PSE&G mounts a static or neutral at the top position of their distribution poles, it would be possible, but difficult, to mount the NextG antenna on the pole top. It is my understanding that in areas with distribution poles having a static or neutral at the top position of the pole, Next G agreed to find secondary and guy poles for mounting the antennas. From a reliability standpoint, a lightning strike to a transmission line could take out power to an entire city. A lightning strike to a distribution line could take out power to an entire neighborhood. A lightning strike to a secondary only pole could take out power to one or two houses. Since it is not common for electric utilities to do any special lightning protection or shielding on secondary only poles or guy poles, it seems reasonable to assume that mounting a NextG antenna on a secondary or guy pole will not have much of an impact on reliability.

4th Bullet:
It is my understanding that NextG recognizes that the NextG communication antenna installed in the supply space must be installed and maintained by supply workers (power lineman). This installation is being addressed by utilities around the country by the communication utility paying a fee to the electric utility for the time to install and maintain the antenna or by the electric utility supplying the communications utility a list of power line contractors that the electric utility uses or qualifies to work on their system. The

communication utility then contracts with the power line contractor to meets the qualified worker provision.

Comments on "Other Issue"

1st Bullet:
I am assuming NextG is willing to pay their fare share of a pole replacement for a pole that has a rotten pole top or NextG would work with PSG&E to select a neighboring pole that does not have a rotten pole top. I would also assume that the poles in question do not have a static or neutral in the top position of the pole or that the pole top rot has not extended down to the crossarm mounting position or else the pole would need to be replaced purely for electrical power use.

Attachments: NESC Rules 235I, 239H, and 420Q.

Attachment B

NESC® Rules 235I, 239H, and 420Q

3. Conductors shall be arranged so that the vertical spacing shall be not less than that specified in Table 235-8 under the conditions specified in Rule 235C2b(1)(c)
4. A supporting neutral conductor of a supply cable meeting Rule 230C3 or an effectively grounded messenger of a supply cable meeting Rule 230C1 or 230C2 may attach to the same insulator or bracket as a neutral conductor meeting Rule 230E1, so long as the clearances of Table 235-8 are maintained in mid-span and the insulated energized conductors are positioned away from the open supply neutral at the attachment.

H. Clearance and spacing between communication conductors, cables, and equipment

1. The spacing between messengers supporting communication cables should be not less than 300 mm (12 in) except by agreement between the parties involved.
2. The clearances between the conductors, cables, and equipment of one communication utility to those of another, anywhere in the span, shall be not less than 100 mm (4 in), except by agreement between the parties involved.

I. Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

1. General

   Communication antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space in accordance with the applicable rules of Sections 42 and 44. See also Rule 224A.

2. Communication antenna

   The clearance between a communication antenna operated at a radio frequency of 3 kHz to 300 GHz and a supply line conductor shall be not less than the value given in Table 235-6, row 1b.

   NOTE 1: The antenna functions as a rigid, vertical, or lateral open wire communication conductor.

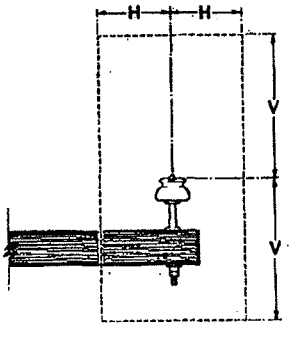
   NOTE 2: See Rule 420Q.

3. Equipment case that supports a communication antenna

   The clearance between an equipment case that supports a communication antenna and a supply line conductor shall be not less than the value given in Table 235-6, Row 4a.

4. Vertical or lateral communication conductors and cables attached to a communication antenna

   The clearance between a supply line conductor and the vertical or lateral communication conductor and cable attached to a communication antenna shall be not less than the value given in Rule 239.



V = Vertical clearance
H = Horizontal clearance

Figure 235-1—Clearance diagram for energized conductor

EXCEPTION: Vertical runs of effectively grounded supply conductors may have a clearance of 25 mm (1 in).

H. Requirements for vertical communication conductors passing through supply space on jointly used structures

All vertical runs of communication conductors passing through supply space shall be installed as follows:

1. Metal-sheathed communication cables

Vertical runs of metal-sheathed communication cables shall be covered with suitable nonmetallic material, where they pass trolley feeders or other supply line conductors. This nonmetallic covering shall extend from a point 1.0 m (40 in) above the highest trolley feeders or other supply conductors, to a point 1.80 m (6 ft) below the lowest trolley feeders or other supply conductors, but need not extend below the top of any mechanical protection that may be provided near the ground.

EXCEPTION 1: Communication cables may be run vertically on the pole through space occupied by railroad signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

2. Communication conductors

Vertical runs of insulated communication conductors shall be covered with suitable nonmetallic material, to the extent required for metal-sheathed communication cables in Rule 239H1, where such conductors pass trolley feeders or supply conductors.

EXCEPTION 1: Communication conductors may be run vertically on the structure through space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

3. Communication grounding conductors

Vertical communication grounding conductors shall be covered with suitable nonmetallic material between points at least 1.80 m (6 ft) below and 1.0 m (40 in) above any trolley feeders or other supply line conductors by which they pass.

EXCEPTION 1: Communication grounding conductors may be run vertically on the structure though space occupied by railroad-signal supply circuits in the lower position, as permitted in Rule 220B2, without covering within the supply space.

EXCEPTION 2: Covering is not required in the supply space on metallic or concrete supporting structures.

4. Clearance from through bolts and other metal objects

Vertical runs of communication conductors or cables shall have a clearance of one-eighth of the pole circumference but not less than 50 mm (2 in) from exposed through bolts and other exposed metal objects attached thereto that are associated with supply line equipment.

EXCEPTION: Vertical runs of effectively grounded communication cables may have a clearance of 25 mm (1 in).

I. Operating rods

Effectively grounded or insulated operating rods of switches are permitted to pass through the communication space, but shall be located outside of the climbing space.

J. Additional rules for standoff brackets

1. Standoff brackets may be used to support the conduit(s). Cable insulation appropriate for the intended service is required; non-metallic conduit shall not be used to meet basic insulation requirements.

NOTE: See Rule 217A2.

O. Cable reels

Cable reels shall be securely blocked so they cannot roll or rotate accidentally.

P. Street and area lighting

1. The lowering rope or chain, its supports, and fastenings shall be examined periodically.
2. A suitable device shall be provided by which each lamp on series-lighting circuits of more than 300 V may be safely disconnected from the circuit before the lamp is handled.

   EXCEPTION: This rule does not apply where the lamps are always worked on from suitable insulated platforms or aerial lift devices, or handled with suitable insulated tools, and treated as under full voltage of the circuit concerned.

Q. Communication antennas

When working in the vicinity of communication antennas operating in the range of 3 kHz to 300 GHz, workers shall not be exposed to radiation levels that exceed those set forth by the regulatory authority having jurisdiction.

NOTE: See OSHA 29 CFR 1910.97, Subpart G [B63]; OSHA 29 CFR 1910.268, Subpart R [B64]; FCC Bulletin No. 65 [B30]; IEEE Std C95.1™-2005 [B57].

421. General operating routines

A. Duties of a first-level supervisor or person in charge

This individual shall:

1. Adopt such precautions as are within the individual's authority to prevent accidents.
2. See that the safety rules and operating procedures are observed by the employees under the direction of this individual.
3. Make all the necessary records and reports, as required.
4. Prevent unauthorized persons from approaching places where work is being done, as far as practical.
5. Prohibit the use of tools or devices unsuited to the work at hand or that have not been tested or inspected as required.

B. Area protection

1. Areas accessible to vehicular and pedestrian traffic
   a. Before engaging in work that may endanger the public, safety signs or traffic control devices, or both, shall be placed conspicuously to alert approaching traffic. Where further protection is needed, suitable barrier guards shall be erected. Where the nature of work and traffic requires it, a person shall be stationed to warn traffic while the hazard exists.
   b. When openings or obstructions in the street, sidewalk, walkways, or on private property are being worked on or left unattended during the day, danger signals, such as warning signs and flags, shall be effectively displayed. Under these same conditions at night, warning lights shall be prominently displayed and excavations shall be enclosed with protective barricades.
2. Areas accessible to employees only
   a. If the work exposes energized or moving parts that are normally protected, safety signs shall be displayed. Suitable barricades shall be erected to restrict other personnel from entering the area.
   b. When working in one section where there is a multiplicity of such sections, such as one panel of a switchboard, one compartment of several, or one portion of a substation, employees shall mark the work area conspicuously and place barriers to prevent accidental contact with energized parts in that section or adjacent sections.

Attachment C

Curriculum Vitae of David J. Marne, P.E.

Curriculum Vitae

David J. Marne, P.E.

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619 S.W. Higgins, Suite C
Missoula, MT 59803
Phone: (406) 544-8997
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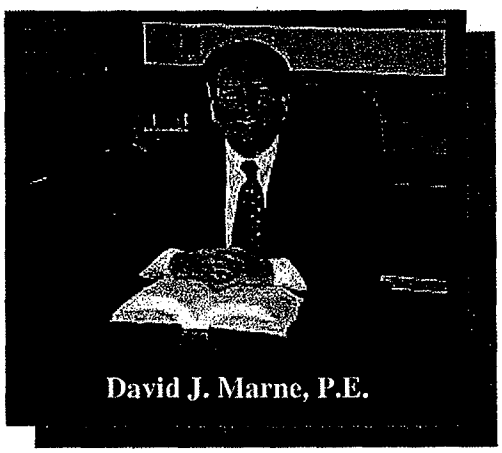
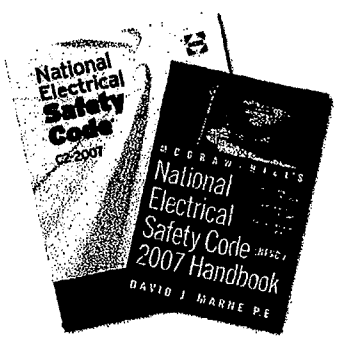
Email: davem@marneassociates.com
Web: www.marneassociates.com



David J. Marne, P.E. is a registered professional electrical engineer. Mr. Marne is the author of *McGraw-Hill's National Electrical Safety Code® (NESC®) Handbook* and is a nationally recognized speaker on the NESC®. He serves on NESC® Subcommittee 4, Overhead Lines – Clearances. He is company president and senior electrical engineer for Marne and Associates, Inc. in Missoula, Montana where he specializes in National Electrical Safety Code® (NESC®) training, OSHA training, and engineering design. Mr. Marne has over 24 years experience engineering and managing transmission and distribution line projects, substation projects, electrical system planning studies, and joint use (power and communication) projects.



The 2007 National Electrical Safety Code® (NESC®) (above left) and McGraw-Hill's NESC® Handbook authored by David J. Marne, PE (above right)

Education

Montana State University, Bozeman, Montana
Bachelor of Science in Electrical Engineering (BSEE)
Graduation Date: June 1983

Various Continuing Education Courses, 1983-present
Transmission and Distribution Line Design and Staking, Substation Design, System Protection and Coordination, System Over-voltage Design, Engineering and Operations Conferences, Pole Conferences, Joint Use (Power and Communications) Conferences, Electromagnetic Fields (EMF), Corrosion Control, Project Management, Finance and Accounting, OSHA Compliance and Workplace Safety, OSHA 1910.269 Qualified Worker, National Electrical Safety Code® (NESC®) Sub-Committee Meetings.

Experience

Transmission and Distribution Line Engineering

Responsible for the engineering management and/or engineering design of over 40 transmission line related projects and over 225 distribution line related projects. Projects have involved a variety of voltage levels, conductor sizes, structure types, terrain types, right-of-way constraints, and environmental issues. Designs for transmission and distribution lines include both overhead and underground circuits (including underwater locations) in both urban and rural settings. Engineering services provided for transmission and distribution engineering projects include planning, cost estimating, design, bidding, construction administration, construction observation, right-of-way, and permitting.

Substation Engineering

Responsible for the engineering management and/or engineering design of over 60 substation related projects. Projects have involved a variety of voltage levels, transformer ratings, bus sizes, structure types, site plans, grounding issues, protection schemes, metering types, communication systems, ownership, and environmental issues. Designs for substations include both live front and dead front equipment in both urban and rural settings. Engineering services for substation projects include planning, cost estimating, design, bidding, construction administration, construction observation, site work, and permitting.

Electrical System Planning Studies

Responsible for the engineering management and/or engineering design of over 95 electrical system planning related studies. Projects have involved a variety of studies including long range plans, construction work plans, sectionalizing and coordination studies, voltage drop studies, fault current studies, motor starting studies, power factor analysis, electromagnetic field (EMF) reports, and environmental studies.

Experience (continued)

Joint Use (Power and Communication) Engineering

Responsible for the engineering management and/or engineering design of over 25 joint use (power and communication) related projects. Projects have involved a variety of power line voltage levels and communication line (phone, CATV, fiber) cable types. Engineering services include calculating and reviewing clearance, and strength and loading issues in accordance with the National Electrical Safety Code® (NESC®) and Joint Use Agreements. Services also include field data gathering, determining make-ready requirements, and field construction observation.

National Electrical Safety Code® (NESC®)

Nationally recognized expert on the National Electrical Safety Code® (NESC®). Author of *McGraw-Hill's NESC® Handbook* and presenter of NESC® seminars around the United States. (See Publications and Presentations for additional information.)

Knowledgeable of the National Electrical Code® (NEC®), Occupational Safety and Health (OSHA) Regulation 1910.269, 1910.268, and 1926.950 through 1926.960, California General Order 95 (GO95) and other codes and standards related to the electrical power and communication utility industries.

Electrical Investigations/Expert Witness Opinions

Electrical investigations and expert witness opinions for cases involving power line contacts, electrocution, lightning, power failure, process control systems damage, and electrical service failures resulting in loss of life, injury, and property damage. Electrical investigations related to electromagnetic field (EMF) concerns. Electrical investigations related to power theft and stray voltage complaints.

Management Experience

President and CEO of Marne and Associates, Inc. Responsible for all aspects of corporate management and company direction.

Branch Manager of SSR Engineers, Inc., Missoula, Montana office. Responsibilities included administration, marketing, and engineering. Reported directly to the company president of an 80+ employee firm spread across five offices. Elected to SSR Engineers, Inc. Board of Directors in 1998 and served as a trustee on the Board of Directors until SSR Engineers was purchased by HDR Engineering in 2003.

Department Manager of the Transmission and Distribution (T&D) group of HDR Engineering in Missoula, Montana. Similar management duties as described above in addition to maintaining relationships with other managers and corporate personnel throughout a 3200+ employee firm with over 80 offices.

Work History

Marne and Associates, Inc.

Missoula, Montana 2005-Present
President
President of Marne and Associates, Inc. which provides National Electrical Safety Code® (NESC®) training (public seminars, in-house seminars, and web based training), OSHA training, training aids (software, books, manuals, etc.), accident investigation, expert witness services, and engineering design.

HDR Engineering, Inc.

Missoula, Montana 2003-2005
Transmission and Distribution Department Manager/Senior Electrical Engineer
(HDR Engineering purchased SSR Engineers on 8/1/03)

Department manager and senior electrical engineer in charge of electrical engineering design for electric utility clients and National Electrical Safety Code® (NESC®) presentations.

SSR Engineers, Inc.

Missoula, Montana 1990-2003

Branch Manager/Senior Electrical Engineer

Branch manager and senior electrical engineer in charge of electrical engineering design for electric utility clients and National Electrical Safety Code® (NESC®) presentations.

Project Engineer 1988-1990

(SSR Engineers purchased General Engineers on 3/1/88)

Project electrical engineer involved with electrical power, lighting, and communication projects for utility, industrial, and commercial clients.

General Engineers, Inc.

Missoula, Montana 1985-1988

Design Engineer

Design electrical engineer involved with electrical power, lighting, and communication projects for utility, industrial, and commercial clients.

Mare Island Naval Shipyard

Vallejo, California 1983-1985
Design Engineer
Design electrical engineer involved with electrical power, lighting, and communication projects for the public works department of a naval shipyard.

Publications

Marne, David J., *McGraw-Hill's National Electrical Safety Code® (NESC®) 2007 Handbook*, Conforms to the 2007 NESC®, McGraw-Hill Publishing, New York, NY, 2007

Marne, David J., *McGraw-Hill's National Electrical Safety Code® (NESC®) Handbook*, Conforms to the 2002 NESC®, McGraw-Hill Publishing, New York, NY, 2002

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Presentations

- Applying the National Electrical Safety Code® (NESC®) to Day-to-Day Utility Work
  Presented at various utility associations and utility companies across the United States.
- Applying the National Electrical Safety Code® (NESC®) to Day-to-Day Utility Work – Transmission Voltage Focus
  Presented at various utility companies across the United States.
- National Electrical Safety Code® (NESC®) Rules for Joint Use Construction
  Presented at various utility associations and utility companies across the northwest.
- Major Changes and General Overview of the 2007 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies across the United States.
- Major Changes and General Overview of the 2002 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies across the United States.
- Major Changes and General Overview of the 1997 National Electrical Safety Code® (NESC®)
  Presented at various utility associations and utility companies around the northwest.
- OSHA 1919.269: Electric Power Generation, Transmission and Distribution
  Presented web seminars for various utility companies across the United States.
- OSHA 1919.268: Telecommunications
  Presented web seminars for various utility companies across the United States.
- Distribution Line Design
  Presented web seminars for various utility companies across the United States.

Awards

IEEE Senior Engineer Membership Award

SSR Engineers, Inc. 15 year service award

HDR Engineering, Inc. Professional Associates and Pathfinders Award

Professional Affiliations

Institute of Electrical and Electronics Engineers (IEEE), Senior Member Status

IEEE Power Engineering Society (PES)

National Society of Professional Engineers (NSPE)

Montana Society of Professional Engineers (MSPE)

Licensure

Professional Engineer, State of Montana, License Number 9428PE

Professional Engineer, State of Idaho, License Number 6426

Professional Engineer, State of Washington, License Number 39601

Attachment 5
NextG DAS Street Light Installation
In Del Mar, California